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MISSOURI BOTANICAL GARDEN

BULLETIN

Volume 60

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MISSOURI BOTANICAL GARDEN

BULLETIN

VOLUME LX NUMBER 1

JANUARY-FEBRUARY 1972

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St. Louis Gardening

January and February

A TIME TO LOOK through catalogs, dream, and plan. If you aren't satisfied with your garden, now is the time to begin making changes. Mistakes are easier to correct if you make plans to scale on paper. Decide where you want to plant your trees, shrubs, or flowers, then study local catalogs to see what is best. Look around your neighborhood and visit the Missouri Botanical Garden to see what is thriving. Ask questions and join a local garden club.

On mild days, prune old wood out of trees and shrubs. Provide water as well as seed and suet for the birds. They are consuming many insect eggs that would otherwise hatch out in early spring.

Check house plants for insects and disease. See that they get plenty of light, and occasionally spray-clean foliage with room temperature tap water. Repot plants when pots are filled with roots.

For an early start in spring, get containers cleaned and ready for sowing seed of flowers and vegetables. This is a good time to sow perennial seed in the back yard cold frame. Water regularly and ventilate the cold frame on bright sunny days.

In January you can still force some bulbs such as paperwhite narcissus for indoor use. Give them lots of light once growth starts and keep cool, as too much heat will cause stems to stretch.

Watch temperatures in the home greenhouse carefully, and don't overwater. Plants will be starting to show new growth as days begin to lengthen. Pansy seed started now in your greenhouse will give satisfactory plants to set out in late March that will bloom over a long period. Get soil ready for busy days ahead.

Late in February check your sprayer and supply of dormant oil spray to use on trees and shrubs when temperatures are over 45° and there is no danger of frost for a couple of hours after spray is applied. □

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Gentian (cover)

Carla Lange

THE COVER IS an illustration taken from a woodcut in Hieronymus Bock's *Kreütterbuch* representing the gentian *(Gentiana lutea)* of the family Gentianaceae which contains about seventy genera and approximately seven hundred species.

The gentian was named by the Greeks after King Gentius of Illyria who is said to have discovered it or to first have tried its medicinal values as a cure for the plague spreading through his entire army.

This beautiful genus of herbaceous plants is mostly of alpine origin *Gentiana lutea* is the yellow gentian and of a hardy, perennial, and flowery kind. It is a native of Europe and Asia Minor and flowers in its wild state between June and August. The cultivated gentian can be propagated only from seeds which should be sown in a cold frame in November; seedlings will appear the following March and April. The young plants should be transferred into pots during the month of August where they may be kept until being put outdoors. Special care should be exercised not to break the root.

The root of the gentian is the only medicinal part of the plant. It has little or no smell, but does have an extremely bitter taste. The extract of the root of the gentian has been much used as a cure for various ailments of the stomach; however, to hide its bitter taste, the extract has usually been prepared by having the root sliced and mixed with dried orange peel and fresh lemon peel. The extract can also be made into pills, with or without aromatic additions. In Switzerland, Austria, and Bavaria a gentian brandy is made which is a very popular tonic for the stomach.

Bock himself says of the gentian that its root is the one used more than any other root in Germany. He also states that there is no better remedy against poisonous dog bites than the juices extracted from gentian.□

Hieronymus Bock's Kreütterbuch

Carla Lange

THE ILLUSTRATIONS for the covers of this year's *Bulletins* were taken from Hieronymus Bock's *Kreütterbuch* (Herbal) published in Strassburg in 1546 in the German language. It contains almost 600 small woodcuts of plants.

Hieronymus Bock or Hieronymus Tragus, as he called himself when writing in Latin (Tragus being the literal translation of his last name), was born in 1498 in Heidesbach not too far from Heidelberg, Germany. His parents seemed to have been moderately wealthy and gave the young Hieronymus a good education, always with the understanding, however, that he would eventually become a monk and enter a monastery. In this he greatly disappointed his parents since he not only felt no desire whatsoever for a cloistered life, but even supported the Lutheran Reformation.

In 1523, at the age of twenty-five, he entered the services of Palgrave Ludwig at Zweibrücken as a school teacher, but since his ardent love for plants and his pursuits in botany were well recognized, he also was appointed by Ludwig as supervisor of his gardens which Bock is supposed to have vastly enriched. He stayed in this position until the death of his patron in 1532. Ludwig was succeeded by Friedrich II, a confirmed Catholic. Because of his religious beliefs, Hieronymus Bock left Zweibrücken and moved to the nearby village of Hornbach where he became a Protestant preacher. During his stay there, he collected plants in the neighborhood which still offered a wild vegetation and was a botanist's paradise. He usually dressed as a peasant on his botanical excursions so as not to draw undue attention to himself.

Hieronymus Bock was a contemporary of the famous botanist and physician Otto Brunfels, whose plant illustrations were the first drawn from living plants. Brunfels and Bock were known as the first two of the "German Fathers of Botany." Brunfels was well aware of the importance of Bock as a botanist and several years before his death, he visited Bock in Hornbach trying to persuade him to write an herbal in German. Bock himself says in the preface of his work *"De stirpium maxime . . ."* published in 1552: "When

Kreütter Buch.

Darin Vnderscheid / Würckung vnd Namen der Kreüter so in Deutschen Landen wachsen / Auch der selbigen eigentlicher vnd wolgegründter gebrauch inn der Artznei fleissig dargeben / Leibs gesundheit zů behalten vnd zů fürderen seer nutzlich vnd tröstlich / Vorab dem gemeinen einfaltigen man.

Durch H. Hieronymum Bock aus langwiriger vnd gewisser erfarung beschriben / Vnd jetzund

Von newem fleissig übersehen / gebessert vnd gemehret / Dazů mit hüpschen artigen Figuren allenthalben gezieret.

Darüber findestu

Drei volkomene nutzliche Register /

vnder welchen / Das erst die gemeine Latinische vnd Griechische Namen der Kreüter hat / Das ander die Deutsche / Das dritt die anzeig der Artznei vnd rhat für allerlei kranckheiten vnd leibsgepresten.

Mit Keiserlicher Freiheit auff Siben Jar.

M. D. xlvj.

Todd Studios

Title page of Hieronymus Bock's *Kreütterbuch* published in 1546.

Todd Studios

Hieronymus Bock, botanist and author, shown here in a woodcut from his herbal *Kreütterbuch*.

information about the labors and the journeyings which I hade undergone in behalf of plants had in some way been conveyed to the most learned Otto Brunfels of pious memory, he himself came journeying all the way from Strassburg to Hornbach, that he might see my gardens and collections. These things pleased him so much that from that day forward he ceased not to exhort, as did also others by letter, that I would reduce all this matter to order, and give it to the German public."

In 1554 at the age of fifty-six, Bock died at Hornbach of consumption from which he had suffered all his life. He survived his wife and eight of his ten children. Half a century later, a memorial tablet was found at the ruins of St. Fabian's church bearing the inscription "*Anno Dom. 1554, 21 Febr. Hieronymus Tragos, animae corporisque medicus, et canonicus huius aedis, in Domino Jesu obdormivit; cuis anima in consortio beatorus quiescit.* Amen."

Bock's first book on plants written in the German language did not have any illustrations, but was written with the intent that the German public become familiar or recognize the plants by their description alone. His descriptions were so detailed and superb and such a success that his first work was republished in Latin so that other than German botanists and scholars might be able to read it. In all his works, Bock never described a plant he had not personally seen and examined, leaving out even some which had been recommended for their medicinal values by older physicians. Also, he carefully notes the exact locations where any of the plants may be found, therefore his work comes close to being a flora in the modern sense. He preferred not to follow the then customary system of listing the plants in alphabetical order, but rather put the plants together according to their relationship to each other.

He said himself: "In describing things, I come as nearly as I can to keeping by themselves such plants as nature seems to have linked together by similarity of form." He considered his theory of grouping trees, shrubs, and herbs as natural and valid and upheld the tradition that trees are of the highest rank and the herbaceous plants of the lowest. In his herbals he does not follow the system dating back to Dioscorides of listing and describing the plants according to their effects and uses, but divides them in three categories: 1) wild plants with aromatic flowers, 2) clover, grasses, edible plants, and vines, 3) trees and shrubs.

Bock was the first botanical author who stated the approximate month of the annual flowering of plants which indicates that he must have kept copious notes throughout the years in order to be able to tell which tree blooms early in the year and which flowers appear later in the season.

Plumier named the genus *Tragia* of the euphorb family in Bock's honor. He has been called by many botanists the first forerunner of Linnaeus and the creator of modern botany. □

Summer Flowering Shrubs

Paul A. Kohl

WHETHER A GARDEN is large or small, some shrubs are needed for background planting and, in planning a spring garden, there are numerous flowering kinds that may be used. For the summer garden there are few blooming shrubs available so the purpose of this article is to tell about the kinds that may be grown in our region.

Bottlebrush buckeye (*Aesculus parviflora*) is a dwarf horse-chestnut, native in the south-eastern states, and equally at home

Author photo

Bottlebrush buckeye, the dwarf horse-chestnut, grows along the main west walk that leads south from the Climatron toward Tower Grove House.

Author photo

Buddleias can be found growing along the walk that leads from the Main Gate to the Old Rose Garden.

in St. Louis gardens. It needs room to spread and grows six to eight feet high and therefore is unsuitable for the small garden. For shady areas under trees it has no equal. After the initial planting suckers gradually fill in the entire area between plants and since the leaves are large and numerous no weeds grow under them. Each June the panicles of white flowers appear, resembling bottle brushes, hence the name, bottlebrush buckeye.

There are three shrubs, two from Asia and one from southern Europe, which each winter are either partially or completely frozen to the ground. For that reason they are all treated alike in the spring by cutting away the previous year's growth. Even though not all of the canes are frozen it is just as well to remove them as the plants grow rapidly into fine four- to five-foot specimens by mid-July.

Author photo

The chaste tree can be seen growing behind the north yew hedge that runs along the lily pools.

Author photo

Crape-myrtle grows along the south wall of the Linnaean House.

The first of these shrubs to bloom is the buddleia *(Buddleia davidii)*, commonly called butterfly bush or summer lilac. It starts to flower in July and continues into September. There are pink, lavender, purple, and white varieties available under names like Pink Charming, Fascinating, Purple Prince, White Peace, White Profusion, and so on.

Number two in the group is the chaste tree (*Vitex agnus-castus*) which is as easily grown as the buddleias and has the same blooming period in mid-summer. The lavender flowers are borne in clusters and by branching repeatedly the whole shrub is soon covered with a mass of flowers. The leaves and stems have a pleasing aromatic odor when handled.

The third member of this summer group of shrubs is the crape-myrtle (*Lagerstroemia indica*). For profusion of bloom over a long period, beginning in late July, this is a good shrub for any garden. It is best to plant crape-myrtles in sheltered areas protected from the north wind. Like buddleias and vitex the stalks of the previous season are cut back in early spring. Nothing is gained by waiting and hoping for some of the canes to bud out. The plants grow to a maximum of five to six feet in a season in this area. Further south, as in Williamsburg, Virginia, the climate allows crape-myrtles to grow much taller. We are fortunate that we can grow this shrub so far north. Red, pink, lavender, and white varieties are available, the red and pink varieties being the kinds usually seen in St. Louis gardens. Watermelon red is a good variety; this is the one we have been growing here in the Garden.

Author photo

The rose mallow grows at the edge of the little stream just south of the lily pools.

Author photo

This false spirea *(Sorbaria sorbifolia)* is just south of the lily pools on the northwest end of the Knolls.

Rose-of-Sharon or shrub althea is a tall shrub frequently planted in gardens and familiar to most gardeners. Often the old violet-colored variety is grown, but newer and better kinds with pink, red, and white flowers are also available. There are double-flowered varieties but these are not as showy as the single forms with their large hollyhock-like flowers. In catalogs these plants are listed as althea or *Hibiscus syriacus*.

Another hibiscus that is not a shrub but a perennial which grows tall enough in the summer to be treated as a shrub is the rose mallow (*Hibiscus moscheutos*). Good varieties have been developed from the native plants of swampy areas and these grow well in rich garden soil when given additional water in dry periods.

The false spiraeas (*Sorbaria arborea* and *sorbifolia*) are included in this list of summer blooming shrubs. They can hardly be recommended for the average garden because of their great height which may be ten to fifteen feet and equally as broad. But they are graceful shrubs with their white panicles of flowers in late July. □

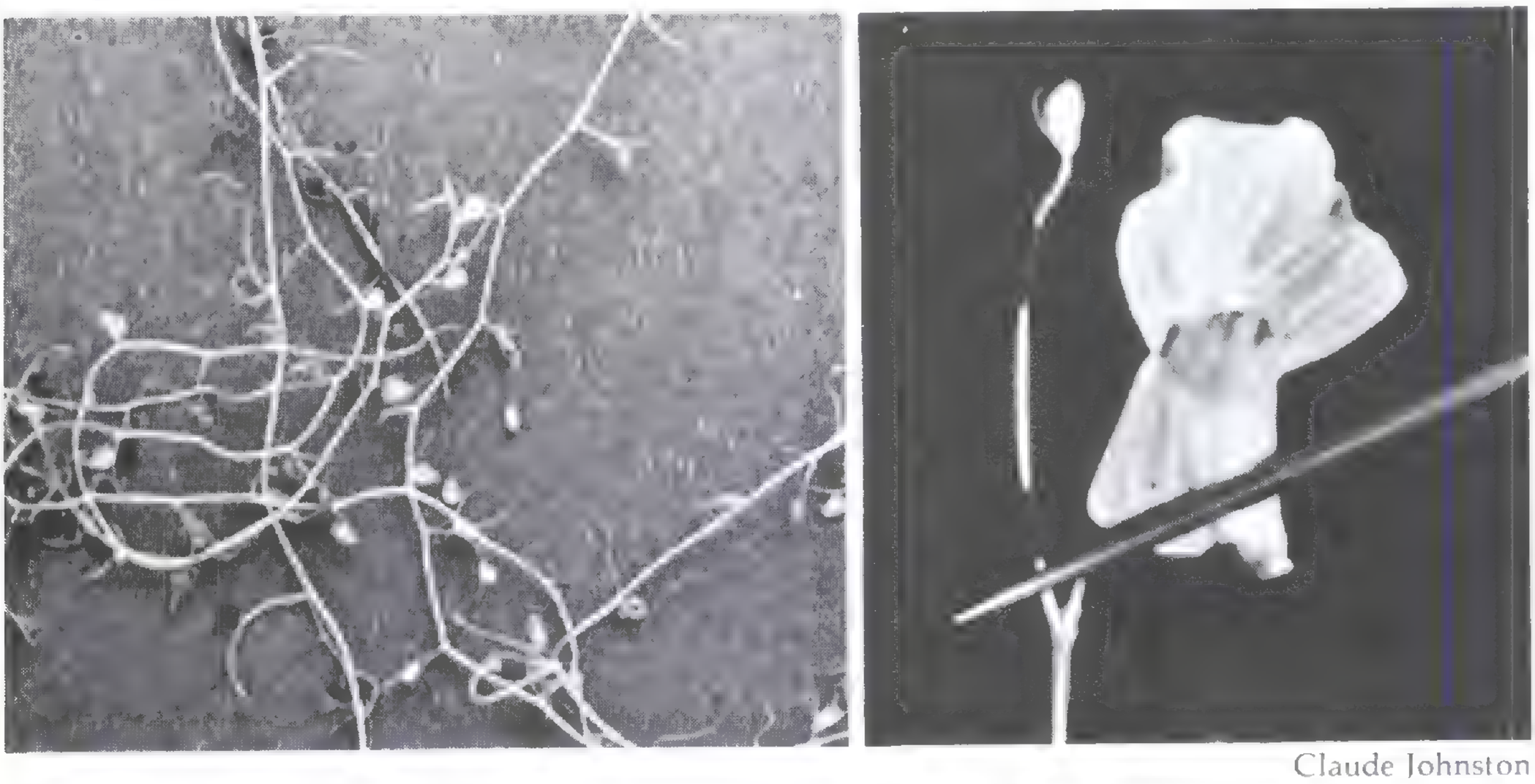
An Aquatic Bugcatcher: the Bladderwort

Charles Kreher

Charles Kreher worked at the Garden for many years, and is an expert on waterlilies and medicinal plants and herbs, as well as the horticulture of annuals and perennials.

PERIODICALLY A SMALL but prolific volunteer appears in the lily tanks of the growing ranges. It is *Utricularia* or bladderwort which normally grows outside, and in Missouri begins to flower in late May or June. The conditions which exist during the winter months in the lily growing area of the Garden, warm water and an air temperature of 70-75 degrees Fahrenheit, make growth and flowering possible in February and March when the pictures were taken.

It's hard to say just how or when the plant first appeared in the lily tanks. Sometimes the devil does his dance and strange unexplainable things occur. We did have it in the aquatic collections years ago, but then it disappeared until the winter of 1970-71.



Claude Johnston

The bladderwort plants *(Utricularia gibba)*, shown here out of water, appear as floating masses of small hairlike stems and leaves, with many beadlike bladders attached to the leaf axils.

Flowers of the bladderwort are bright yellow and small, but showy. A low power magnifying glass will help one see the orchidlike beauty of this tiny bloom.

Utricularia is an interesting plant, but it can become a problem when one is trying to grow tropical water lilies.

Utricularia is a member of the bladderwort family, Lentibulariaceae, with several species found in the temperate zone and many more growing in the tropics. Some of the species growing in the tropics are terrestrial and may be found growing in moist soil, whereas the species found in our area are aquatic. In the Ozarks, *Utricularia gibba* and *U. vulgaris* are found in masses on mucky debris, on the surface of upland sink hole ponds, and other swampy areas as well.

At first sight, one might think of the water surface as being covered with algae, but with closer observation, one can see the hairlike stems and leaves which make up the floating mass. Attached to the leaf axils are tiny transparent beadlike structures; under a hand lens or microscope these appear as tiny bladders.

These flat pear-shaped bladders each have a mouth guarded by a hanging door. There are four stiff bristles near the lower free edge of the door that, when brushed by a small animal, distort that edge, causing the door to spring open. Water rushes into the bladder carrying the insect with it, and then the door closes. The solution digests the animal except for the shells and skeleton which remain within the bladder.

The flowers are bright yellow and when seen in masses are quite showy. They stand above the surface of the water on stalks three to four inches high, bearing one to three flower buds. The open flower bears a resemblance to the Dancing Girl Orchid, the general shape and color being similar.

The top half of the blossom is composed of three united petals; the lower half is hinged, and when an insect alights, the weight brings the lower petal down, revealing the two stamens and pistil. The blossom has a spur or tube which extends from the back of the lower petal and protrudes out at the bottom edge of the petal, giving it a hornlike appearance.

When the flower has been fertilized, a small round capsule forms bearing the seeds. As it begins to increase in size, its weight brings the stalk down to the surface of the water where it floats until it bursts, scattering the mature seed on the surface of the water. The seeds sink or become lodged in bits of debris, and lie dormant until the following spring when they begin this cycle of life once again.

High Protein Corn in the Garden's Collections

Hugh Cutler

THE GARDEN HAS ONE of the world's finest collections of Indian corn, gathered by a series of staff members and graduate students during years of study of plant evolution. Some of the ears were gathered as long as fifty years ago and are of kinds no longer grown. Many specimens are dried or carbonized cobs and fragments excavated from archeological sites. This collection is not only a valuable record of evolution of the New World's most valuable crop but it also fills a utilitarian role as an index to variability and to the geographical distribution of characters which might be useful in agriculture. This function of the corn collection is similar to that which our herbarium performs in telling the location and time of fruiting of plants which contain drugs or might be used in plant breeding.

A study of our corn, besides illustrating over 5,000 years of evolution, uncovers features which can improve existing corn or be used to create types of corn for new purposes. Once a desirable character is found in our collections, living seed can be recollected, or in many cases, found preserved at one of the seed storage centers established by the Department of Agriculture and the National Research Council.

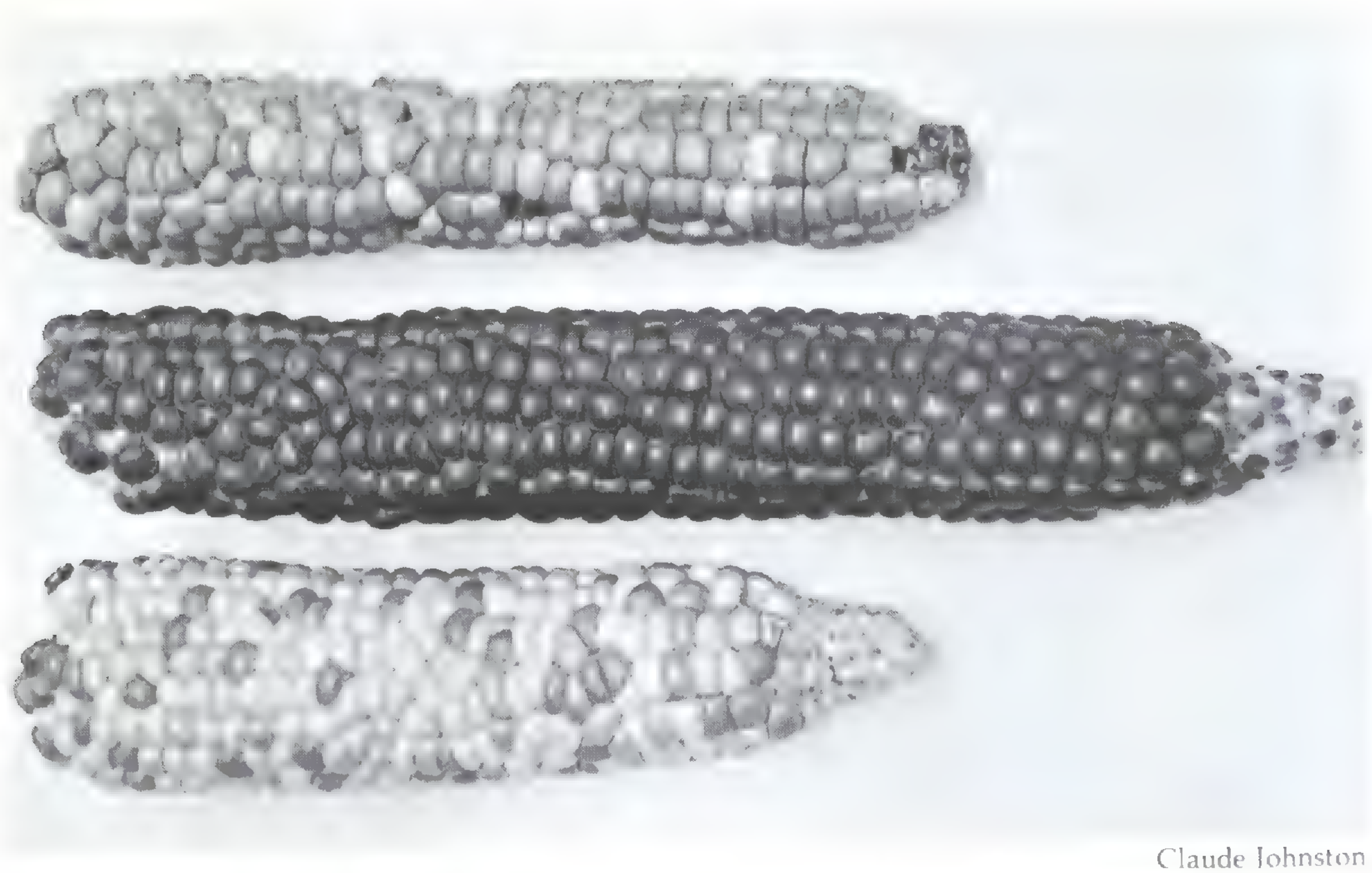
Protein is an essential part of the diet of man and his domesticated animals. Too little protein, or a deficiency of certain types

of protein, results in malnutrition, especially in young children who may be permanently damaged physically and mentally. Most of the poorer people in the world can afford little other protein than that contained in the grain crops they eat. In the Americas, and in some underdeveloped parts of Africa and Asia, corn is the major subsistence crop. Eight to ten percent of the grain is protein, but half of this is zein, a protein which cannot be utilized by man, hogs, and other single-stomached animals. For many years there have been attempts to increase the protein content. Most promising has been the discovery that two genes, or characters, called opaque-2 and floury-2, could increase the nutritional value so much that corn could potentially provide most of the protein needed in diets. Piglets grow more than three times faster with this new corn than with normal corn. Children with obvious signs of protein deficiency showed great improvement when fed the new corn.

The opaque-2 and floury-2 genes reduce the amount of the unuseable zein and increase the amount of lysine, an amino acid which can be used by the human body. New varieties of corn with the high-lysine character are being grown in Colombia and on a small scale in the United States with work still going on to improve the quality of the corn and the yield per acre.

A few months ago Dr. M. J. Wolf, who works on grain properties for the United States Department of Agriculture's Northern Research Division at Peoria, asked us to help him find a variation in South American Indian corn which might have value as a source of protein. He had found that some grains on a Peruvian variety of corn had two or more layers of cells in the aleurone, a layer which lies directly beneath the outer skin of the corn grain. Most corn grains have only a single layer of aleurone cells. Aleurone contains a higher concentration of protein than the rest of the grain, so any increase in volume of aleurone should increase the percentage of protein.

The yellow color and the shape of Dr. Wolf's Peruvian grains were similar to those of corn from eastern Bolivia which belongs to an unusual and highly variable race called Coroico, after the town in Bolivia where the first collections were made. Most corn of this race is grown farther east and variants of the race have spread into Peru, Ecuador, Brazil, and Paraguay.



Claude Johnston

Coroico type corn from Reyes, Bolivia. The varied colors of the ears are in the high protein multicellular second layer of the kernels. This layer of cells is called the aleurone. In the middle ear, a reddish tint in the outside skin of the kernels masks the oranges and yellows, making the cob appear a dark reddish-brown.

The most extreme examples of Coroico corn in our collection come from near the town of Reyes, in the Province of Beni, Bolivia. They are grown by Indian families in clearings in the forests along the streams or on wooded rises of the predominantly grassland country. The arrangement of grains on the ear, and the colors and structure of the grains, cob, and plant are so distinct that it seemed likely that there would be other unusual features.

The first Coroico grains we examined turned out to have six layers of cells in the aleurone, but, since these grew progressively smaller towards the inside of the grain, the total thickness of the aleurone was only about twice that found in a normal grain. As our studies progressed we even found a few ears with as many as seven aleurone layers.

Several ears from our collection were sent to Dr. Wolf who found that, in addition to increased protein, the grains contained a higher proportion of lysine. Many of the cells also contained more than one nucleus, suggesting that the aleurone layer was still actively multiplying.

The seed from our collections is too old to germinate so we are searching through lists and descriptions of viable seed in storage in the several seed storage facilities, and asking collectors who will visit Bolivia to obtain seed. The next steps will be to select the best Bolivian seed for crossing with strains adapted to the United States and to see how the multi-aleurone layer character is inherited. Eventually it should be possible to combine it with other characters for more and better quality proteins into a high yielding corn adapted to the day length of the corn belt, and into other corn stocks adapted to lower latitudes.

If corn can be bred so that it has more and better protein and still has high yields, it could reduce or eliminate the need for more expensive animal supplementary feeds, like soybean products, and thus decrease the production cost of all kinds of meat. High protein corn can help to reduce the malnutrition which is now found in many parts of the world, especially in underdeveloped tropical countries. Inventories of the available kinds of corn, such as we have in the Garden's collection, are necessary for us to be able to quickly locate other characters which might be useful in fighting hunger in a growing world. □

The Partnership of Hollies and Birds

There is a natural relationship between spiny or thorny evergreens such as a red cedar or a holly and the small birds that roost in their branches during cold winter nights. The birds have shelter from the cold and protection from hawks and owls. The evergreens have the advantage of the bird droppings which wash off with the snows and rains and fertilize the tree. Hollies in particular are strong feeders; they grow their best in very rich soil. By scattering bird seed at the base of holly bushes one one encourages bird visitors and indirectly brings the hollies the fertilizer which is best for them.

E.A.

The Missouri Botanical Garden in Panama

Thomas B. Croat

LESS THAN A MILE from the famous Gaillard Cut of the Panama Canal lies the beautiful 380 acre Summit Gardens. This garden, one of the finest in Central America, is operated by the Panama Canal Company. Formerly it served as an introduction station for plants from all over the world. The garden's plantings now number in the thousands and many species have been introduced from it into all parts of the Republic of Panama.

Summit Gardens and the undisturbed area surrounding it make a fine location for a center of botanical research. There are very few

Author photo

The author is shown here examining living plants in the comfort of Summit Herbarium. Having living specimens to back up the pressed and dried herbarium specimens is very important to the description and study of tropical plants.

comparable situations anywhere in the tropics of the world. When you consider that two-thirds of the world's people live in the tropics and that they are, on the average, undernourished, the importance of such botanical centers is obvious.

With these facts in mind, meetings were held in 1969 between representatives of the Panama Canal Company and of the Missouri Botanical Garden to make arrangements for the establishment of an herbarium and library at Summit Gardens. The institution, named Summit Herbarium and Library, is designed to stimulate and expedite botanical research in the Canal Zone and other parts of Panama.

Following the official establishment of Summit Herbarium and Library, I went to Panama in early 1970 as curator. The Panama Canal Company has provided a large air-conditioned area for the herbarium and library as well as facilities for drying plants. In addition, space has been provided nearby for living quarters for the curator of this new scientific facility, and grounds as well as greenhouse space are available for growing experimental plants.

Author photo

The Missouri Botanical Garden's trailer house, where the curator of Summit Herbarium and Library lives, looks out over the nursery area of the Summit Gardens.

Author photo

Summit Herbarium and Library is located on the air-conditioned second floor of the Summit Gardens' Administration building. The plants of the tropical forest are literally right outside the door, and easily available for study.

Florida State University, through the efforts of Dr. Edwin L. Tyson, has loaned two excellent microscopes plus some older scopes for use in the herbarium. Dr. Tyson teaches for FSU which has a branch in Panama serving the military and civilian population of the Canal Zone.

The position of curator is funded by Missouri Botanical Garden which also provides a house trailer for the curator and his family on the grounds of Summit Gardens. The operating budget for the scientific program is provided by the Missouri Botanical Garden through a National Science Foundation Grant.* This has made possible the purchase of new herbarium cases and a vehicle for field trips, the general care of the herbarium, and the expenses of collecting in Panama.

The herbarium at present contains some 12,000 mounted specimens. Of these, 6000 were contributed on long-term loan by the Army Tropic Test Center and were collected largely by Dr. Tyson and his students. In addition to Dr. Tyson's continuing support of

*NSF GB-26639 issued to Walter H. Lewis.

the institution, the Missouri Botanical Garden has sent approximately 6000 plant specimens from its herbarium. These consist of duplicates of material I collected on Barro Colorado Island and material collected by Missouri Botanical Garden expeditions in other parts of Panama.

The library at Summit Gardens consists of agricultural bulletins, books on horticulture, and many important taxonomic works on the flora of Central America. The Garden in St. Louis sends duplicate books and journals that are pertinent to tropical botany.

The herbarium and library at Summit Gardens in Panama are essential to systematic and ecological research in the tropics and to our botanical explorations of Panama. Without a permanent base, the logistical problems of such trips are overwhelming. The tropical station, with its literature and living plants, also provides botanists and students with valuable back-up material for the plants they collect.

It is important that our botanical explorations be stepped up in the next five to ten years before the tropical forests are completely destroyed. A more complete understanding of these tropical areas is essential if we are to learn new ways of practicing tropical agriculture that will help these vast equatorial regions of the world reach some measure of economic and political stability.

Unfortunately it has become increasingly difficult for the Garden to obtain federal funds for the operation of Summit Herbarium and Library at the very time when studies of the tropics are most urgent. The accelerated pace of destruction of the tropical forests signifies clearly that much of what the human race can ever learn about them must be learned in the next few decades.

For this reason, the Garden will make every effort to continue operation of the tropical facility in Summit Gardens in the years to come. Summit Herbarium and Library is a valuable part of Missouri Botanical Garden's basic botanical research.□

What's Going on at the Garden?

New Ex Officio Members, Board of Trustees

DR. WILLIAM H. DANFORTH, who recently succeeded Dr. Thomas H. Eliot as Chancellor of Washington University, is an ex officio member of the Board of Trustees of the Missouri Botanical Garden.

Dr. Danforth, who was Vice-Chancellor for Medical Affairs for five years and a member of the medical faculty of Washington University since 1957, is a 1951 graduate of Harvard Medical School. He returned to his native St. Louis to intern and later become a resident in medicine at Barnes Hospital, and an assistant in pediatrics at Children's Hospital. As a Fellow in Cardiology at Washington University he began research in the metabolic processes that underlie the failing heart. As a result of these and later investigations he was elected to membership in the American Society for Clinical Investigations, the country's most elite group of clinical investigators. This is just one of a long list of honors and awards that have come to Dr. Danforth in his distinguished career as physician, researcher, and educator.

In addition to being Chancellor of Washington University, Dr. Danforth is Chairman of the Board of Directors of the Danforth

Foundation; on the Board of Trustees, American Youth Foundation; President of the Board of Governors, St. Louis Christmas Carols Association; on the Board of Trustees, Princeton University; Advisory Member, Alliance for Regional Community Health; member of the Board of Directors, Higher Education Coordinating Council of Greater St. Louis; and a member of the Institute of Medicine, National Academy of Sciences.

Dr. Danforth is married to the former Elizabeth Gray, and is the father of four children.

Daniel L. Schlafly is a returning ex officio member of the Board of Trustees of the Missouri Botanical Garden. Mr. Schlafly succeeds Malcom W. Martin as President of the Board of Education of St. Louis. He is a devoted friend of education, having been a member of the Board of Education since 1953 and its president three terms. During those terms, he also served on the Garden's Board of Trustees. Mr. Schlafly received the St. Louis Award in 1960 "for his efforts to improve the quality of education in the city of St. Louis," and was a charter member of the Higher Education Coordinating Council.

Currently he is Chairman of the Board of Trustees of St. Louis University, having served in this capacity since 1967. Mr. Schlafly, who is Chairman of the Board of Arkansas Beverage Company, is a native St. Louisan, a graduate of St. Louis University High School and of Georgetown University in 1933. He is married to the former Adelaide Mahaffey and is the father of three children.

Tower Grove House

Mrs. Warren Kirkbride, Chairman, Mrs. Jerome Kircher, and Mrs. John S. Lehmann represented the Historical Committee of Tower Grove House at a recent staff meeting where it was announced that Mrs. Virginia M. Brewer, who joined the Garden as Tower Grove

House Manager in April, 1968, is retiring to move to Ohio where her family now lives. Dr. Raven presented a handsome and unusual Victorian lap secretary to Mrs. Brewer in recognition of the fine job she has done. Mr. Hibbs, Assistant to the Director, announced that Miss Virginia M. Drummond would be the new manager of the house effective November 1971.

Horticulture

Bob Dingwall reports that, "With our speeded-up program of improving facilities and making better use of existing space, we are now able to begin broadening our scope and getting into a position where, through research, we can better serve the study of horticulture."

The work on the Garden's grounds continues with a major project of pruning large trees, as well as the planting of new speci-

Claude Johnston

Garden volunteers regularly demonstrate growing and planting skills and methods in the Growing Center.

mens. New trees and shrubs donated by Coles Nursery, Circleville, Ohio and by Mr. Clarence Barbre of Webster Groves have been set out in the on-going program of replacing old specimens and adding new species and clones to the Garden's living collections.

The generous support and help of the Boxwood Society has spurred the start of the Anderson Memorial Boxwood Garden, a living tribute to the late Dr. Edgar Anderson who was so well-known to botany and St. Louis.

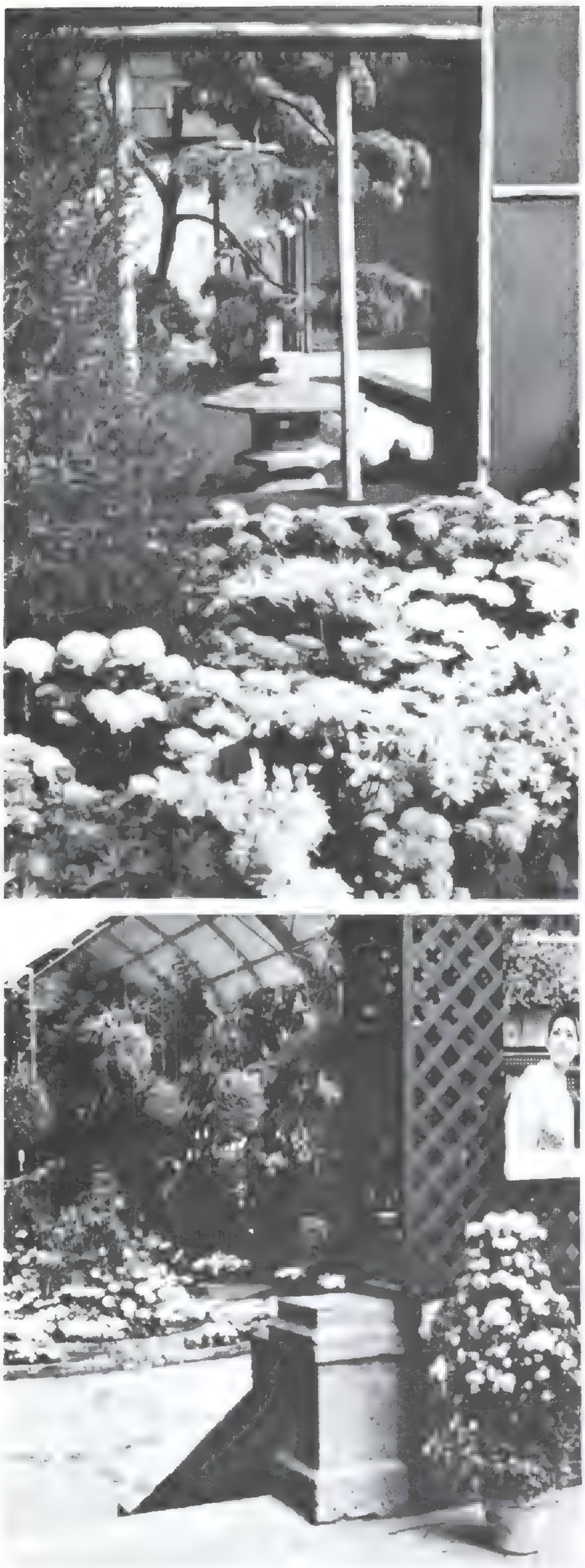
Two fairly recent projects are proceeding in good style. The organic garden, first planted two years ago, will be enlarged in 1972 and used as a vegetable test garden, again with the help of donated seed and supplies. The Garden's lake area project is also being expanded, with more wildflowers and ferns being planted each year.

The All-American Rose Test Garden Committee named Alfred Saxdal as their official judge to replace retired Judge F. B. McMath. A new test garden was started this year with the All-American Annual Test Garden Committee supplying the trial seed. This area will be expanded in 1972 with more plant material from local sources. Increasingly, our midwest gardeners will be able to see new offerings of roses and annuals and observe their performance under our very specific climatic conditions.

In the growing ranges, renovation continues, with automatic watering and shading plus new fibreglass roofing now installed in four houses. Improved growing conditions, new methods of growing, labor and space saving practices are making the entire Horticulture

Claude Johnston

The Growing Center has become a popular spot for lectures and workshops on the many aspects of horticulture.



Claude Johnston

The 1971 Chrysanthemum Show emphasized the Oriental origin of this traditiona fall flower. Ladies skilled in the Japanese art of Ikebana demonstrated this stark and beautiful style of flower arranging at the Preview Party. Shown here at the Preview Party are (lower right photo, left to right) Director and Mrs. Peter H. Raven, Leroy Fisher, the designer of the Chrysanthemum Show; Mrs. Walter Stern, President of the Friends of the Garden; and Mrs. Robert E. Kresko, Preview Party Chairman.

Department more efficient. The flower shows now have more of an emphasis upon new varieties of the popular flowers and an increased focus upon educational features. The Growing Center is aiming, as funds allow, toward becoming an information center for the whole Garden. The greenhouse just north of the Climatron will soon be established as a Mediterranean garden, showing plant material from five areas of the world that have similar climate and geography.

In the Climatron, the work continues in replanting, improving drainage, contouring the planting areas, reducing plant duplications, and expanding the exhibited species and varieties. The jungle aspects of the Climatron are apparent in the rapid growth of both plant and animal life, which necessitates a constant schedule of pruning, training, and cleanup. This ongoing attention minimizes plant loss from insects and disease. The Climatron pool still presents a problem which we hope to improve through better circulation and filtration.

Project STAY, now in its second year, is gaining through experience and is now more able to give the enrolled Soldan High students a better opportunity to gain job experience and a new interest in completing their high school program. This program has had significant success in decreasing high school dropouts and thus making the whole STAY program of great value to the St. Louis community.

The Garden has planned, carried out, and is maintaining the plantings in the main foyer of the new Equitable Assurance Building in downtown St. Louis. This extension of the Garden's talent and assets into the downtown area should attract more people to the Garden itself.

Arboretum

"The Missouri Botanical Garden Arboretum and Nature Reserve is now in the midst of its renovation and development program aimed toward making it one of the country's finest centers for environmental education," Dave Goudy said in his report. "We have renovated the public facilities, including a Visitor Center, classroom and meeting place in the Trail House, and an improved and extended trail system.

Claude Johnston

This view across the Meramec River looks toward the newly acquired Morton property from the farm side of the Arboretum.

"We now have a tour vehicle that provides a narrated hour tour of the Arboretum," Superintendent Goudy continued, "as well as a descriptive brochure and an *Ecological Guide to the Trails*. Trained naturalists provide groups with educational tours concentrating on ecology and man's role in the environment. In addition to Garden programs, the National Park Service utilized the Arboretum for its Summer Adventures Program, bringing a field experience in environmental awareness to nearly 1500 children."

"This summer, for the first time, the Pitzman Program was held at the Arboretum, with 360 young people being bussed from the Garden to the Gray Summit Nature Reserve," Sandra Thornton of the Education Department reported. "The program, now in its fourteenth season, has always been well received, but this year the reaction of students and parents was even more enthusiastic. Each of the ten day sessions was limited to ninety students, from seven to sixteen years of age.

Sandra Thornton

Children in the Garden's Pitzman Program study pond life on the edge of the Arboretum's Pinetum Lake.

"The instructors, including three college students, Kenneth Peck, and me, emphasized natural history in the field, studying the plants and animals of the Arboretum. We all had to be alert for unusual and unpredictable appearances of the local natives. For instance, what do you do with a tough, wary raccoon accidently trapped in one garbage can, and a young, thoroughly shaken raccoon trapped in another garbage can? (You clear a very wide path through the children and carefully release the raccoons in the direction of their concrete slab hiding place.)

"We kept our program flexible so that we could shift classes around in case of rain or extreme heat, and to take best advantage of all the varied areas of the Arboretum. Within walking distance of our Trail House headquarters there were a small lake, glades, woods, a spring with cool drinkable water, a flood plain, Brush Creek, and the Meramec River," Miss Thornton continued.

"Lanier Criger arranged for members of the Audubon Society to teach bird study twice each week. Other interesting guest teachers included an officer from the Missouri Department of Conservation, a lady with a bird nest collection, Mr. Criger speaking on wolves, and Bill Voelker with his live hawk and owl showing a feather collection and telling about his studies of hawks.

"The goal of the Pitzman Program has always been to teach an understanding of an appreciation for all living things. This year we were fortunate to be able to use the Arboretum to teach the concept of plant and animal communities while on hikes, our walking natural history lessons," Sandra Thornton concluded.

Dave Goudy reported that the Arboretum staff is working with the Parkway School District in a pilot program to develop ways of integrating the Arboretum as a field site into the regular science curriculum of the schools. This blend of academic and field experience is crucial in our efforts to teach mankind more about his physical environment. We hope that the Parkway Program will develop into a program for all schools in the St. Louis area.

Six hundred acres of farmland south of the Meramec River is being considered for the development of a model farm, perhaps of the late 1800's vintage. As with our other major plans, this is dependent upon our receiving active outside support.

Library

The Garden's Library is a valuable botanical asset that began in Henry Shaw's time and was encouraged by Shaw's scientific advisor, Dr. George Engelmann. The book collection includes rare pre-Linnaean books, Linnaean books, folios of great beauty and value in both text and illustration, an extensive general collection of botanical publications, periodicals dating back to the early nineteenth century, maps that tie the modern world to the earlier worlds of exploration, microfiche for reference to major herbarium collections of other botanical gardens, and manuscripts, some of which are only now being translated and evaluated.

Eugenia Maddox, Librarian, reports that current and ongoing activities of the Library include the selection of new books and periodicals that will make the collections more valuable to the botanical world, and the cataloging and classifying of new books. A major project that is aimed toward the Library's move into the new Lehmann Building in mid 1972 is that of recataloging and reclassifying the entire collection; checking open shelves for titles that should be in the Linnaean collection; and the collecting, sorting, and indexing of manuscripts. Eventually the photograph file, now being mounted and labeled by the *Bulletin* staff will be filed and indexed by the Library archivist.

Generous gifts from the National Science Foundation, and the Allen P. and Josephine B. Green Foundation have made many of the Library's current programs possible. The restoration of the *Redoutés Les Liliacées* was made possible by a gift from Mrs. John Lehmann.

The Library's collection and research facilities are available, not only to Garden staff members, but also to any serious student. Those interested should contact the Library.

Herbarium

The activities of the Herbarium include three major functions, reported Walter Lewis at a recent staff meeting.

The first of these is collection of plant specimens in the field, which is the basis of the entire systematic program and has to be nurtured and developed at all times. About 30,000 specimens are added

annually to our collection which now totals some 2.1 million plants from all over the world. This collection represents an historic and current record of the Earth's biosphere which must be understood and preserved for the sake of all living things.

The second of the Herbarium's activities focuses upon research conducted by staff and students. Research projects include the work being done on the *Flora of Panama* project; a detailed analysis of cellular components of the Texas star by John Semple; scanning electron microscope studies of pollen types causing allergies in man; and studies such as that on the evolution of bignoniaceous trees.

The third major function of the Herbarium is its responsibility to provide an interesting, relevant educational program, not only to Garden students, but to the community as well.

The college program has been enhanced by the establishment of the Institute for Systematic and Evolutionary Botany (ISEB), a cooperative venture involving the four large universities in Greater St. Louis with the Garden as its epicenter. Thus far ISEB has concentrated on the graduate program, but a committee is now exploring the possibility of beginning an undergraduate ISEB course, hopefully in fall of 1972.

Dr. Lewis said, "Right now, our direct contact with the public is through the Engelmann Botanical Club, a recently revitalized organization that is looking for new members, anyone interested in botany, natural history, and our Missouri countryside. For a recent meeting, I gave a slide talk entitled Plants in Africa, and the Club has also had Saturday excursions into the Ozarks. Membership is currently at about fifty, with more interest being shown as the programs become better known.

"Through our plant collection, research, and education programs, we are enhancing the knowledge of plants and, in our small way, contributing to the betterment of mankind and the world in which we live," Dr. Lewis concluded.

Maintenance and Engineering

"Work that's not directly involved with plants, books, or plant specimens generally falls into the responsibility of the Maintenance and Engineering Department," said Jim Hampton recently. "This

Claude Johnston

Renovation of the growing ranges has included installation of fibreglass roofing, and a complete revamping of heating system and growing benches. Improved growing conditions are making the Horticulture Department much more efficient.

Claude Johnston

Concrete walkways, new fibreglass roofing, better arrangements of benches, and improved heating and watering systems have made the care of the Garden's orchid collection not only easier, but better for the plants.

department's work is really a behind-the-scenes operation. For instance, we put in a tremendous number of man hours in all seasons on the maintenance and repair of the boiler system. Just think what would happen if this heating system were out of commission for even two hours during a winter cold snap. Probably every tender greenhouse plant in the Garden would die."

This department, which comprises about a dozen men including a few who are part time, oversees all new construction as well as the constant program of renovation and upkeep of building and equipment. In addition it is responsible for admissions, the Flower Wagon, security, and the setting-up, special lighting, and clean-up for special parties and other Garden functions.

Garden security is excellent, in a time when this seems a major problem. Better use of a night lighting system in key areas and the efficient use of available watchmen has kept the Garden safe from the current waves of vandalism so prevalent in other city areas. The watchmen are vital, not only to security, but also to the greenhouses as they are responsible for checking night temperatures in the growing houses. □

Reader Survey Response

THE RESPONSE to our Reader Survey that was printed in the September-October, 1971 *Bulletin* was so very generous that those of us who write for and work on the magazine will bask in the glow of our loyal readers' thoughtful comments for a long time. There is always a barrier between the producer of the printed page and the reader of that same printed page. As we plan our *Bulletin*, we do try very hard to leap the barrier and look at our articles as well as the physical makeup of the publication from our readers' point of view. Our Reader Survey reaffirmed many ideas we have long held about the place and purpose of the *Bulletin*, and very delightfully brought us into direct contact with our audience. (People really do read the *Bulletin*!!!)

We picked October 22 as the cutoff date for assessing the responses, and first discovered that we received a 3.6% return, which for this kind of a survey is very good indeed. Circulation Manager Clarence Cherry then tabulated all the answers, figuring the percentages on the different subjects.

We are happy to report that over 40% of our subscribers always read the *Bulletin*, and 19.4% read it from cover to cover. Another 31.6% frequently read it. In addition we have a recorded 3.06% who say they never read the *Bulletin*. (So who filled out those forms!)

Our readers' interests focus mainly on subjects pertaining to home gardening, landscaping, and horticulture. Following close behind is the desire for more articles on environmental topics including the natural history of the St. Louis area, conservation, and ecology. Our format for 1972 includes a renewed emphasis on these subjects as well as how they tie in with the Missouri Botanical Garden and the work of its staff members. The establishment of the Arboretum as an environmental center and nature preserve; the revitalized program in horticultural studies and test gardening; and the continuing programs in botanical research will provide a rich source of material for the *Bulletin*.

We hope our readers will continue to comment upon and criticize the *Bulletin* as our new issues are published. □

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THE MISSOURI BOTANICAL GARDEN . . .

. . . one of the world's leading botanical gardens and botanical research centers, occupies seventy acres in the heart of St. Louis. The Garden was established in 1858 by a prosperous St. Louis merchant, Henry Shaw, and is known locally as Shaw's Garden. The Garden, a non-profit institution, relies for support solely upon contributions from the public, the Arts and Education Council, and income from the Shaw estate. The Garden receives no city or state tax support.

The Garden contains many fine display greenhouses including the world-famous Climatron, extensive collections of orchids, water lilies, camellias, and roses. The Floral Display House is the setting for the Garden's major seasonal flower shows, as well as floral and plant displays by horticultural societies.

Courses in botany, natural history, and horticulture for adults and children are conducted by the Garden staff. Volunteer guides are available for special tours.

The Garden is open every day of the year except Christmas and New Year's Day from 9 a.m. to 6 p.m. May through October, and 9 a.m. to 5 p.m. November through April. On Sundays and holidays throughout the year the Garden remains open until 5 p.m.

Visitors may easily reach the Missouri Botanical Garden by auto and public transportation. It is only a short distance from major hotels and residential areas; south of Highway #40 and east of Kingshighway, on Tower Grove Avenue between Magnolia and Shaw.

The Missouri Botanical Garden Arboretum and Nature Reserve, 2200 acres of rolling Ozark plateau and Meramec River valley, established at Gray Summit, Missouri in 1926, is open to the public.

Support your Missouri Botanical Garden and take part in its activities through the Friends of the Garden. Information may be obtained from the Main Gate, by mail, or phone (314-865-0440).

Missouri Botanical Garden
2315 Tower Grove Avenue
St. Louis, Mo. 63110

MISSOURI BOTANICAL GARDEN

BULLETIN

VOLUME LX NUMBER 2

MARCH-APRIL 1972

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The Missouri Botanical Garden is a Fund Member of the Arts and Education Council of Greater St. Louis.

The Peony (cover)

Carla Lange

THE COVER of this *Bulletin* is an illustration of the peony *(Paeonia officinalis)*, a member of the family of the Paeoniaceae taken from Hieronymus Bock's *Kreutterbuch* published in 154o

The peony or paeonia was named by the ancient Greeks in memory of the mythical physician Paeon. Homer reported that Paeon cured Pluto with this plant after he was wounded by Hercules. Paeon supposedly first received the flower on Mount Olympus from the mother of Apollo and it was said to be the first plant used for medical purposes. The ancient Greeks held the peony in great esteem, believing in its divine origin.

Even in later days it was considered a miraculous plant and it was believed that no evil spirits would invade the places where it was planted, and that even a small piece of the root of the peony worn around the neck as an amulet would protect the bearer from all kinds of afflictions.

In Germany, the peony is known as the Pentecostal Rose *(Pfingstrose)* and Hieronymus Bock says in his herbal that in all of Germany you will hardly find a more beautiful, lovely rose with roots, stems and flowers than the noble rose named after the old Paeon.

Even though the medical values of the peony are not as numerous as those of other plants, they were held to be unfailing. Bock says in his *Kreutterbuch* that the root boiled in water was believed

to cure intestinal ailments, boiled in wine it was used for diseases of the stomach. He further says that twelve ground-up seeds of the peony taken internally prevents belching and vomiting and that fifteen of the crushed seeds prevent horrible nightmares. Since the times of Hippocrates and Theophrastus it has been used as a cure for epilepsy; Pliny mentions the plant as a cure for the falling disease. Apuleius, the Roman philosopher of the second century A.D. said that the peony is a powerful remedy for insanity.

Paeonia officinalis is a native of central and south-central Europe. It has been cultivated in European gardens perhaps longer than any other exotic flower. In this country it was considered an old-fashioned flower and in colonial times no New England garden failed to have its "piny bush." Oliver Wendell Holmes called it "an aristocratic flower."

In Japan and China hundreds of varieties of peonies are cultivated and the Chinese named it the "queen flower." In both countries it is being used extensively in art and decoration.

In the language of flowers the peony stands for "accomplishment" and, curiously enough, also for "bashful shame" as well as for "anger or a frown." Its color and fragrance are closer to the rose than any other flower.

The peony is one of the most common and hardy herbaceous perennials. It grows in a wide variety of soil and should be planted in the fall and well fertilized. It flowers in May and June, the color of the flowers ranging from white through pink and red. Peonies are rarely attacked by insects and are rather immune to various plant diseases. They can stand any climate and do not require any covering even in the severest cold.

Only two species of the genus *Paeonia* are native to North America. These grow on the West Coast in foothills and on mountains up to an elevation of approximately 7000 feet, from Baja California north to British Columbia and east to Wyoming. □

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Cover design by Peter Geist.

St. Louis Gardening

March and April

WITH THE ADVENT of warmer weather, gradually remove mulch from roses and perennials. Work organic mulch into the soil rather than taking it away.

Clean up and rake the lawn. Lightly topdress lawn with well rotted compost or soil enriched with organic matter. Loosen bare areas and seed as soon as soil can be worked.

Remove all weeds that have overwintered before they have a chance to develop, and once the ground has warmed up apply mulch around trees and shrubs to conserve moisture and keep weeds out.

Avoid disturbing roots of azaleas and rhododendrons. Feed cottonseed meal to these as growth commences and apply more mulch if needed.

Complete pruning of late summer flowering shrubs, and remove winter-damaged branches. Fruit trees and grapes, if not pruned earlier, should be done now before growth starts.

March is a good time to remodel your hedge if it needs it. Always keep the top narrower than the bottom so light can reach the lower portions. This also allows the foliage to catch rainfall and channel it into the interior for the roots.

If dormant oil has not been applied to control insects, then apply as soon as possible before growth begins. Follow directions on the container carefully. Apply when temperature will remain above freezing for eight hours.

As soon as soil can be worked, plant lettuce, radishes, spinach, peas, and onion sets so they can mature before hot weather sets in.

For an early start in the flower garden, start annuals from seed inside six to eight weeks before they can be set outdoors. A cold frame is good for this purpose. Seedlings grow somewhat more slowly, but become sturdier, more handsome plants than those started in the house. Some of the hardier types may be started directly in the garden late in this period. Divide and reset late summer perennials that are getting too large or ones that should be done regularly such as hardy phlox and fall asters. □

A Few Tomato Problems

Paul A. Kohl

MANY TOMATO PLANTS are purchased each spring, probably more than any other plants displayed on the shelves of garden centers. Gardeners are always eager to get an early start in planting tomatoes and there is an advantage in planting them in April if they are not stunted by a cold spell of weather. Tomato plants can be protected during cold weather by shielding them with Hotkaps, cones made of waxed paper, or plastic bags, supported with wire hoops, slipped over the plants. Early planted tomatoes bloom and set fruit before the hot weather arrives, but tomatoes that blossom during a hot spell of weather drop their flowers. Temperature is one factor which prevents the development of fruits, and tomatoes do not develop when the thermometer goes below 60- or above 90-degrees. A hormone spray on the flowers sometimes aids in fruit set. Over-fertilization, especially with nitrogen, can also cause blossom drop.

Tomato plants are subject to various leaf diseases some of which are carried by aphids which appear on the young plants. Aphids can be eliminated with a contact spray, like malathion. In some years weather conditions adversely affect tomatoes and when it is thought the plants are diseased the reason might be sudden changes in the weather. One symptom is blossom-end rot, the black, sunken areas that occur on the bottom of the tomatoes. This is partly the result of dry weather following a wet spell or just the opposite.

Hopefully, with good culture, an abundance of tomatoes should be ready for picking about the beginning of July, yet those hopes may be dashed by finding half-eaten, green tomatoes on the ground. Squirrels have developed a fondness for tomatoes. They don't eat them but tear into them for the few seeds they contain. Not finding many seeds in one fruit they go on to the next tomato and ruin it. This is frustrating and to outwit the squirrels is not easy. Completely enclosing a group of tomato plants with a wire chicken netting house is one way. When only a few plants are grown a cylinder of wire netting placed around the plants will protect the fruits. Another method is to cover the plants with a sheet of plastic, held together with clothespins, where most of the fruits are located, or to slip a plastic bag over the plants leaving an opening at the top for heat to escape. If squirrels have ruined your tomatoes in past years try this method.

Paul A. Kohl

Honesty seed pods, some with seeds and some without seeds in the decorative satiny white discs.

Honesty
(Lunaria annua)

Paul A. Kohl

OF THE VARIOUS plants used in winter decorations "honesty" is one of the best. *Lunaria annua* is the botanical name, *luna* being Latin for moon, referring to the satiny white partition of the pods.

The plant is known by several other common names like moonwort, money plant, and satin flower, but usually it is listed in seed catalogs as honesty. It is a true biennial in that it does not bloom until the second season.

The flower stalks grow about three feet tall, producing many lavendar flowers in April, which are followed by the large silvery pods. The seed stalks are ripe by July and may then be stored in a dry place until used for decorations.

Preparing the dried material for winter bouquets is a simple matter. The two outer valves and seeds are removed from each pod which leaves the papery partitions attached to the stems, the branches then being airy, satiny masses of circular disks.

One plant will produce many seeds, some of which might self-sow if conditions are suitable. Seeds may also be planted in pots or sown in the garden in April. Honesty will grow in partial shade.

Wild Poppies for Your Garden

Edgar Denison

Edgar Denison is a well-known Missouri naturalist and artist.

JULIAN STEYERMARK, in his *Flora of Missouri* lists only two species of poppies which are native to Missouri: the bloodroot (*Sanguinaria canadensis*) and the celandine poppy (*Stylophorum diphyllum*). Most people are more familiar with bloodroot, yet the interesting and showy celandine poppies can be a valuable introduction to the home garden.

The common name celandine poppy can be misleading, as is the rule with common flower names, because there are two somewhat similar plants, both members of the poppy family, both called celandine. One is just called celandine by Liberty H. Bailey in his *Encyclopedia of Horticulture*, while the other carries the name celandine poppy. Steyermark uses the same common names.

Let us first consider the celandine *(Chelidonium majus)*. It is an immigrant from Eurasia, which was widely planted in gardens of our eastern U.S. and has naturalized throughout much of the East. It has also been reported in Missouri as an "escape." It has bright yellow flowers, about the size of a quarter, and would be quite acceptable in the garden were it not for the much prettier native American cousin, *Stylophorum diphyllum*. Dr. H. Correvon, the famous French-Swiss who created wildflower gardens of world-wide fame, writes thus about the European poppy:

> In the shade of hedges, always at the base of rock walls, in rock detritus there grows the Great Celandine *(Chelidonium majus)*, that peculiar *Papaveracea* with vivid orange-yellow juice, whose bright, fine foliage and intensely yellow flowers present a strange aspect. The plant is also called the Big Star and Wart-Herb. (Translation by author)

A similar description would hold for the native *Stylophorum*, although our American poppy has much showier flowers. There are other differences such as totally dissimilar fruiting bodies.

Author illustration

The celandine poppy *(Stylophorum diphyllum)* is one of the two species of poppies native to Missouri.

Chelidonium has a long, slender, smooth capsule, while *Stylophorum* develops a three-parted capsule in an ovoid shape which is covered with soft bristles. Both have bluish (glaucous) leaves, which add much to their appearance, but still these many-lobed compound leaves differ considerably between the two species.

Stylophorum is from the Latin *stylus* and refers to the prominent style which protrudes even from the fruit. *Chelidonium* derives from the Greek for swallow, a reminder that the swallows return at the blooming time of these poppies. This seems somewhat far-fetched but we have no other explanation.

Our Missouri *Stylophorum* blooms in early spring, around the end of April or early May. However, in my garden, they keep flowering through the middle of summer, not with the vigor of spring, but showing single flowers at least through July. They grow in humus-rich soils either on the bottom lands of creeks or on the lower elevations of protected slopes facing either north or south. There seem to be at least three requirements to make *Stylophorum* happy: humus, moisture, and protection from strong winter winds.

Just a few years ago a very spectacular colony of possibly 50 plants grew at the Arboretum close to the bottom of the escarpment bordering the Meramec flood plain. Unfortunately, this colony disappeared completely without visible interference from men or beasts. It seems necessary to conclude that the celandine poppies lost in their struggle with more aggressive plants, such as *Mertensia*, the Virginia bluebell. However, some specimens still grow at the Arboretum in the creek bottomlands leading to the Meramec River. In Washington State Park on Highway 21, *Stylophorum* seems to be happier, luxuriating on the north-facing slope which defines the Big River valley. Here, too, the display varies greatly from year to year. Unfortunately, their habitat is now being more and more defiled by beer cans and other refuse left behind by visitors.

In the garden, I should say, in *my* garden, *Stylophorum* is anything but bashful. The plants grow bigger than in the wild, about two feet high and that much across. They prefer total shade, such as provided by old deciduous trees, but will tolerate morning sun. They DO receive water in dry periods like the rest of the garden, and that, I believe, they appreciate. Seed formation is prodigious, and as the garden receives a covering of compost each fall, seedlings sprout prolifically. Having a very fleshy texture and a taproot, the celandine poppy cannot and should not be transplanted, even if extreme care is exercised. Seeds can easily be gathered, and if some readers want to try them, I may have some to share. I have no knowledge if the seeds remain viable in storage. Self-seeded specimens "do their own thing" and need no help other than water in dry spells.

Stylophorum is an appealing garden plant, and will do well in a spot that has shade, moisture, and humus. □

Living off the Land

Hugh Cutler

ALL OVER THE COUNTRY there has been a revival of interest in back to nature movements. During the Depression and World War II there were similar trends but today's escapees from city life and pollution may sometimes go so far as to live in sod houses or tipis and gather part of their food from wild plants. Books for sale at the Garden Gate Shop reflect this quest for simple life patterns.

Most popular of the books has been a series by Euell Gibbons, who began in 1962 with his *Stalking the Wild Asparagus* ($2.95 paperback). Gibbons lived off the land for brief periods in several parts of the United States and recommends foraging for wild plants as a way to utilize an available resource and to introduce variety into the menu. He does not recommend living off wild plants as a permanent way of life and most of his preparation and cooking is done in a well equipped kitchen and includes purchased ingredients such as flour and salt.

To gather a palatable and healthy diet throughout the year would be difficult or impossible for most people, yet with imagination, hard work, and planning, food can be found growing nearly anywhere. Some of Gibbons's best collecting, as he relates in his sixth and latest book, *Stalking the Good Life: My Love Affair with Nature* ($5.95), has been in city parks, along roadsides, and in other man-disturbed places where dandelions, burdock, sow thistle, and other Old World weeds grow, along with such American weedy natives as cattails, chokeberries, hawthorns, and pokeweed. Gibbons' latest book is a good introduction to the pleasant art of foraging. Most of his readers are armchair adventurers but his enthusiasm is so infectious that many will try some of the more common plants.

Dandelions are probably the easiest plants to find and the best to eat at this time. In fall up through late winter the freshly dug roots may be washed, sliced, boiled with the inner leaves, and served with butter. I prefer to place the plants in moist sawdust or peat moss in

a cool dimly lighted place for a few weeks and then harvest the crisp shoots. They are excellent in salads, far better than the endive from grocery stores which is frequently old and bitter.

Gibbons provides only an introduction to the many edible plants. Right now, in late winter, three of the most common edible plants in weedy lawns and roadsides are chickweed, henbit, and shepherd's purse, not one of them mentioned by Gibbons. They are described, with illustrations and recipes, in *Edible Wild Plants of Eastern North America* ($10.00) by Fernald and Kinsey (of Kinsey sex reports fame). If you travel west of Missouri, you should have Donald Kirk's *Edible Wild Plants of the Western United States* ($3.95 paperback). Kirk's book is small enough to carry in your pocket and line drawings and descriptions enable you to identify the most common wild foods of the West.

The Garden Gate Shop has reprints of several older books which contain slightly different plants and recipes. Medsger's *Edible Wild Plants* ($7.50) has illustrations and discussions of the more common useful plants. Nelson Coon's *Using Wayside Plants* ($5.95) uses small line drawings and distribution maps as aids in identification of plants for dyes, medicine, and food, and plants which are poisonous. Bradford Angier's books are designed for people in the northwestern states and only a few of his plants are found in Missouri. His most recent books are *Free for the Eating* ($4.95), and *Living Off the Country: How to Stay Alive in the Woods* ($5.00).

An excellent small paperback which gives ideas and the confidence to use them if you are stranded is *The Survival Book* ($1.95). It is assembled from the best ideas of survival experts working with the United States Armed Forces. There are suggestions for almost every kind of wild region, although the material for each area is limited.

Most plants are harmless but a few, including common ones like potatoes (the green parts), dumb cane, oleander, and lily of the valley, can kill. A recent, usable book with illustrations and clear text is J. M. Kingsbury's *Deadly Harvest: a Guide to Common Poisonous Plants* ($4.95). Muencher's *Poisonous Plants of the United States* ($6.95) is older but still good. Euell Gibbons prefers to learn which plants are edible and stick to these for food, but it is handy to know which plants might be poisonous to pets or curious children so that you can take proper precautions. □

Weed Immigrants

David L. Spellman

David Spellman is a PhD candidate working under Dr. John D. Dwyer, Professor of Biology, St. Louis University and Research Associate at the Missouri Botanical Garden.

"A WEED IS A PLANT with a bad press-agent," according to Bill Vaughan in one of his recent columns. More serious definitions range from simple to complex, but, in the final analysis, can all be summed up in the words of the late Edgar Anderson, "Weeds are plants grown unintentionally by man." The idea implicit in any definition of weed is that of a plant not wanted at a particular time or in a particular place; therefore any species of plant is a potential weed.

This may be seen in the case of some of our more common plants—timothy, alfalfa, clover and lespedeza are desirable plants to the farmer, while to the modern suburbanite intent on maintaining a carpet of green around his home these represent an enemy to be dealt with in terms sometimes bordering on fanaticism. The black-eyed susan, ox-eye daisy, and yarrow are admired by many wild flower lovers, but to the agriculturist they are certainly weeds.

Any attempt to ascertain just what factors result in some plants being truly weedy and others not involves not only a knowledge of the internal workings of the species, but also a detailed knowledge of its ecology—such things as the characteristics of the soils in which it grows, the effects of climatic conditions on growth and reproduction, and susceptibility or resistance to insects and disease. Unfortunately, these factors are known for a relatively few weed species.

In general, it may be said that weeds (1) have small inconspicuous flowers which tend to be aggregated into compact clusters; (2) have a strong trend toward pollination of the flowers by wind; (3) have prodigious fruit and seed production (for example, over a half-million seeds have been observed to have been produced in a single year by a single plant of tumble mustard, *Sisymbrium altissimum* L.); (4) are preponderantly perennial species, which means that many of them reproduce vegetatively as well as sexually; (5) produce seeds

which may retain their capacity to germinate for many years. (Experiments have shown that some weed seeds can germinate even after twenty to forty years of burial in the soil.)

Plants generally get from one place to another with the aid of wind, water, animals, and man. The first three of these are important over relatively small geographic areas. Man, however, as both a short and a long distance dispersal agent has no equal, and has been primarily responsible for transporting weeds from one area or continent to another. Among the ways in which man may carry weed seeds from one place to another are (1) through impurities in crop or garden seed (2) in hay and livestock feeds (3) via roadways, either rail or automobile (4) farm practices such as cultivation (which may disseminate vegetative parts of plants) and fertilization with manure (5) in packing materials such as straw and sphagnum moss.

In the United States, we may trace approximately fifty per cent of our weed species to European or Eurasian sources. Edgar Anderson suggested that some of our vegetation was as much a Neolithic immigration into Europe as it was a later immigration into the new world. To put it another way, some of our vegetation has its ultimate roots in Asia and spread first into central and western Europe, and later to the New World.

The domination of European and Eurasian weeds is not unique to the United States. Sixty per cent of the weeds in Canada and forty-five per cent of those in south Australia trace their origins back to Europe. New Zealand lists eighty per cent of its weeds from the Old World, with a high proportion of those from Europe.

As might be expected, Missouri has its share of European and Asian immigrants. A survey of Steyermark's *Flora of Missouri* reveals that a total of 273 species or nearly fifty-eight per cent of our adventive flora originated in Europe. If this count is expanded to include Eurasia and the Mediterranean region, the figures become 345 species or seventy-three per cent of the adventive flora. Although not all of these species can be considered weeds, a significant portion of them are.

Since the New World was colonized initially by European peoples, it is only reasonable to expect the high number of weeds from that continent. As would be expected, the early colonists brought with them many plants and seeds from their homeland for use as ornamentals, vegetables, and potherbs, medicinals, or con-

diments. Many of these plants escaped from cultivation and became weeds. Other weeds arrived in this country as stowaways on ships, as impurities in grain, or attached to objects such as farm tools.

One of the most prolific means of plant introduction was in ballast. In the early sailing days, ships which were lightly loaded carried tons of soil and rock as ballast. When the ships reached their destination, the ballast was shoveled overboard onto "ballast grounds." Since this foreign soil contained many thousands of seeds, the potential for the introduction of new plants was high. Naturally, some species finding the new environment not to their liking did not become established. Some persisted as locally restricted populations, while others quickly spread themselves into all suitable habitats.

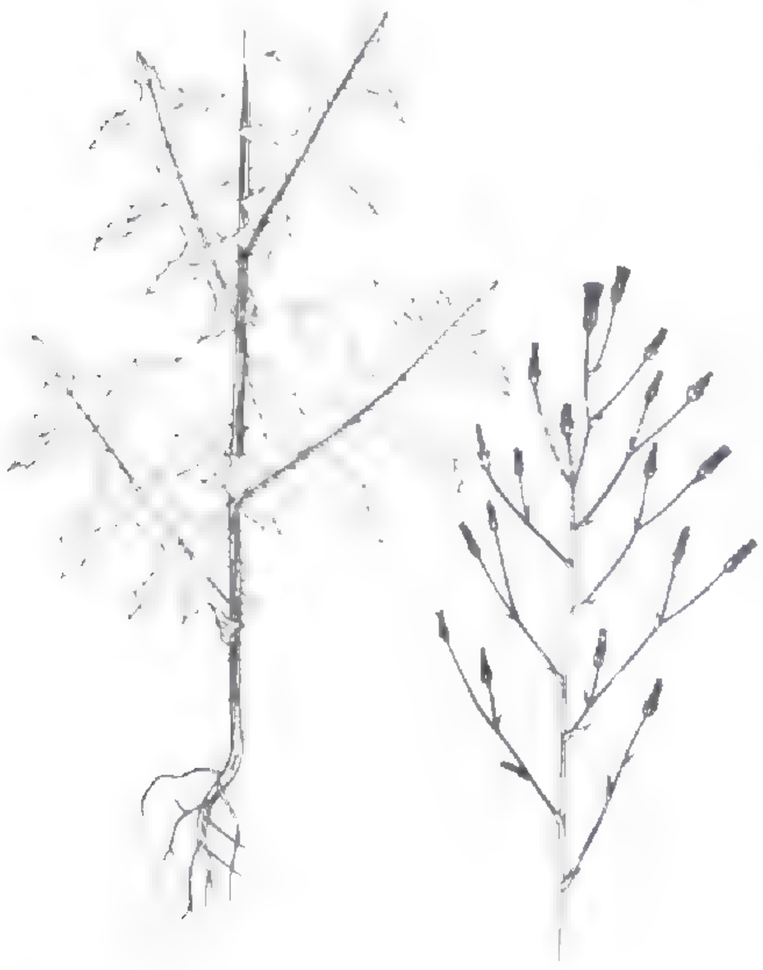
An indication of the rapidity with which some species spread after their introduction into this country is found in the interesting little book written in 1672 by John Josselyn entitled *New-England Rarities*. Josselyn states that no less than forty species of European weeds had "sprung up since the English planted (crops) and kept cattle in New England." He listed such common weeds as shepherd's purse, dandelion, plantain, chickweed, cockle-bur, mullein, smart-weed, St. John's wort, and yarrow. Manasseh Cutler in 1783 reported sixty-six species introduced into New England. Bigelow's *Florula Bostoniensis*, 1814, enumerates eighty-three introduced species and the edition of 1840 lists 140 species, a sixty-nine per cent increase in only twenty six years.

As the great westward expansion progressed and settlers cleared more and more land, new habitats were created for the continued introduction and establishment of new plant materials from other lands. Four examples of well-documented Old World weed introductions are the Canada thistle, field or European bindweed, prickly lettuce, and Russian thistle.

The Canada thistle (*Cirsium arvense* (L.) Scop.) is believed to have been introduced into Quebec, Ontario, New York, and New England during the middle of the eighteenth century. It spread rapidly, for by the year 1795, Vermont had passed legislation to prevent its further import and maintenance. New York outlawed the plant in 1813. It is believed to have been taken into Fauquier County, Virginia during the Civil War, making its entrance in baled hay

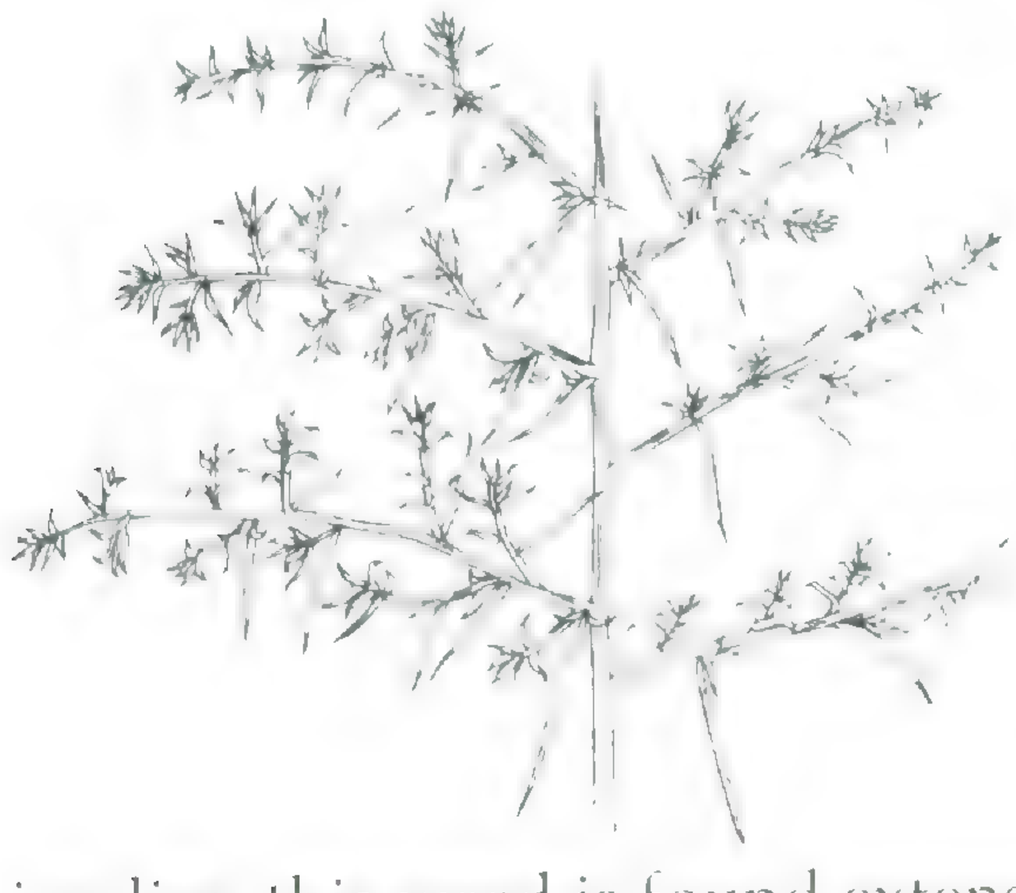
brought in from the north. The thistle was not reported west of the Allegheny Mountains before 1835, but by 1844 had spread throughout northern Ohio. By 1926 it was prevalent across the entire northern half of the United States, a distribution which remains essentially unchanged at the present time.

A common little vine along our roadsides and in other disturbed places is field or European bindweed *(Convolvulus arvensis* L.*)*. Although most likely of Eurasian origin, it has found this country quite to its liking, as evidenced by its spread throughout most of the United States and parts of Canada. It was apparently introduced into the U.S. along the Atlantic Coast as its first recorded occurrence was in that region about 1843. Asa Gray in the first edition of his manual (1848) stated that this weed was "sparingly naturalized from Maine to Pennsylvania; and likely to become a troublesome weed." Bindweed was collected in Kansas in 1877, Nebraska in 1888, Iowa in 1889, and Minnesota in 1892. By 1890 it was collected in Southern California, and presently enjoys a range from Nova Scotia to Florida and west all the way to British Columbia and California.



Prickly lettuce (*Lactuca scariola* L.) is an example of a weed which in just a little over 100 years has come to occupy virtually all of the United States and adjacent Canada. Originally native to southern Europe, North Africa, and temperate East Asia, this plant was a weed in nearly all except the colder parts of Europe and Asia by 1894. Its exact date of entry into this country is not known with certainty, but is thought to have been about 1860. It is presumed to have come in with ships' ballast to one or more of the Atlantic ports and moved west with the development of the railroads. Prickly lettuce was first seen about 1863 in Cambridge, Massachusetts, this being the only location given in the 1867 edition of Gray's manual. The sixth edition

of the same book in 1889 shows the plant as occurring throughout the Atlantic states to Missouri and Minnesota. The localities known at this time were primarily in and around several of the larger cities along the Great Lakes and the Mississippi River. It was found in St. Louis in 1877 and was quite common in Kansas City by 1889. The plant was found in Salt Lake City in 1880, Wenatchee, Washington in 1883 and in Eight Mile, Oregon in 1884. It now ranges across the continental United States as far south as Texas, and throughout southern Canada.



Russian thistle (*Salsola kali* L.) is one of the species known commonly as tumbleweed which is familiar to anyone who has traveled through the flat grazing lands of our West. Russian thistle invaded our country rapidly for, as the plant is blown about by the wind, its seeds are shaken out. As its name implies, this weed is found extensively in eastern Russia and western Siberia. It was a serious pest in the barley, wheat, and flax regions of Russia long before its entry into the New World. The plant was first introduced into the United States in 1873 or 1874 as an impurity in flax seed brought from Russia and planted near Scotland, South Dakota. The topography around Scotland is somewhat hilly, and corn was the chief crop grown at the time of introduction of Russian thistle. The standing corn stalks and wooded ravines initially retarded the spread of the weed. By 1877 it had moved only as far as Yankton, South Dakota. Strong winds during the winter of 1887 followed by a dry summer in 1888 caused extensive spreading of the weed. By 1890 its range included significant portions of North and South Dakota, northern Iowa, and northeastern Nebraska. By 1894 the area included all of South Dakota, part of Minnesota, and many isolated localities along the railroads from Madison, Wisconsin to Denver, Colorado and the southern border of Nebraska. The present range covers nearly all of the western United States as well as from Quebec to Georgia and Louisiana. In Missouri, Russian thistle has not become widely established, and is known only in isolated localities in the northwest corner of the state.

Weed as a Word in Western Cultures

Daniel F. Austin

Dr. Austin received his doctorate in biology from Washington University and the Missouri Botanical Garden in 1970. He is now an assistant professor in biology at Florida Atlantic University in Boca Raton.

OUR ENGLISH TERM "weed" is a curious word. There is apparently no related word in use in the United States, but there are words used in the British Isles and northwestern Europe which seem to be related. These words are spelled differently, and mean different things in the modern languages, but they all appear to be connected somewhat mysteriously to the plant termed "woad" in Wales. This plant (*Isatis tinctoria*: Cruciferae) yields a dye which was used by the early inhabitants of Wales.

Historically and geographically the Germanic and Celtic speaking peoples are closely related. Because of this relationship it is not surprising to find ancestral forms of similar words in their history. The languages derived from Low German all contain variations of "weed" or "woad." The remaining Germanic languages contain few similar words. Of the Celtic-derived languages, only Welsh includes related words. *Wid* and *weddw* clearly show a relation between the Welsh and Germanic counterparts. It is only in the languages derived from a Germanic stock that words like *wiota*, *wêd*, *wiod*, *wēod*, *wied*, *wioden*, and *wieden* appear.

The *woad* or *wád* dye was used by the early inhabitants of Wales as a war paint, which often completely covered the almost nude bodies of their warriors. These blue-green men must have appeared as frightening and "unwanted" spectors to the Germanic invaders from the mainland. Perhaps there is a relation between *woad*, the Welsh use of the plant dye as a war pigment, and the "unwanted plant" concept. If these relations prompted the inclu-

sion of *weod* or *woad* into the vernacular of the mainland people, its incorporation is deeply buried in the history of those countries.

The concept of "weed" is strikingly consistent throughout the Western cultures, and in many of the Eastern. There is the "useless plant" of the Germans as *unkraut*, of the Swedish as *ogräss*, the Danish as *ukrudt*, and the Norwegians as *ukrutt*. The idea of "bad plant" is held by the Latin-based languages in the French *mauvaise herbe*, the Italian *erbaccia*, the Spanish *mala hierba*, and the Portuguese *herba má*. The *buruiana* of Rumanian means a "neglected, non-cultivated plant."

The Balto-Slavic languages of Russian, Croato, Polish, and Czech all contain words which refer to undesirable plants. The Celtic languages of Irish, Gaelic, and Breton have words meaning essentially the same.

After the discovery of the New World two new words appear, with spelling variations, in most of the Eurasian languages, *tobakk* and *sigar* (both from Norwegian). Both of these words are associated with the plant discovered by the early explorers of the New World. This plant, the "Indian weed" of the colonists, is tobacco (*Nicotiana tabacum*: Solanaceae). These two words are based on *tabaca* and *cigar* from the Carib Indian languages encountered in the islands of the West Indies. Even today the cigarette is occasionally referred to in the United States as a "weed," but most people do not realize that they are using a colonial concept.

According to Webster's dictionary, the modern meanings of "weed" are:

1. *Archaic*. Wild growth as rank grass, undergrowth, etc.
2. Any plant growing in cultivated ground to the detriment of the crop or to the disfigurement of the place; an economically useless or unsightly plant, esp. of wild growth.
3. *Colloq*. a. Tobacco; esp., tobacco prepared for use. b. a cigar.
4. Something of little value.

As is true with numerous situations, the common usage is not in complete agreement with that of the scientific community. This is most often because of oversimplification in the common usage. Yet, while symposia have been conducted, and many books written about weeds, there seems to be one definition which satisfies most situations: a weed is *any* plant growing where it is unwanted. □

Birding in the Missouri Botanical Garden

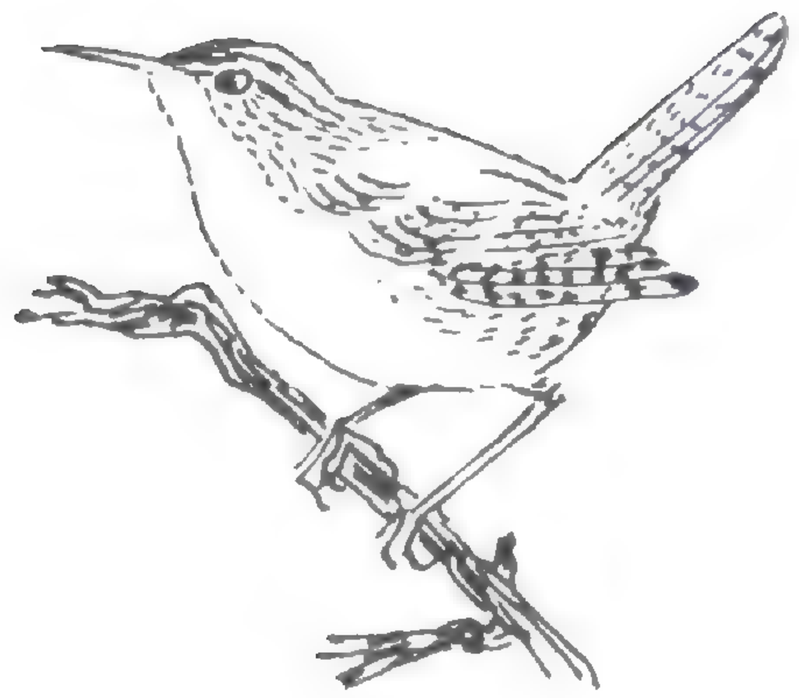
Marjorie Richardson

ONE OF THE GREATEST companions to have with you on a walk through the Missouri Botanical Garden is a pair of binoculars. Birding in the Garden is generally good at any season and always interesting. Mr. George F. Tatum, writing in the *Bulletin* for May, 1916, stated: "After many years' observation of the birds in various places in and around St. Louis, I feel warranted in asserting that the most favored locality is the Missouri Botanical Garden where, during a morning or afternoon walk of not exceeding an hour, in the spring or early summer, one may see or hear from twenty-five to forty species, and usually under such conditions that identification is not difficult."

While "the most favored locality" status might be questioned in 1972, Mr. Tatum could still surely find his twenty-five to forty species on a spring walk, as the northern migrating species use the Garden's fine trees and thickets as stopovers to their nesting grounds. So spring is the finest birding season and a morning walk in the Garden should be productive and exciting. In the fall the same species usually return making that season good birding, too, but more challenging as fall birds are harder to identity. The challenge only adds to the enjoyment!

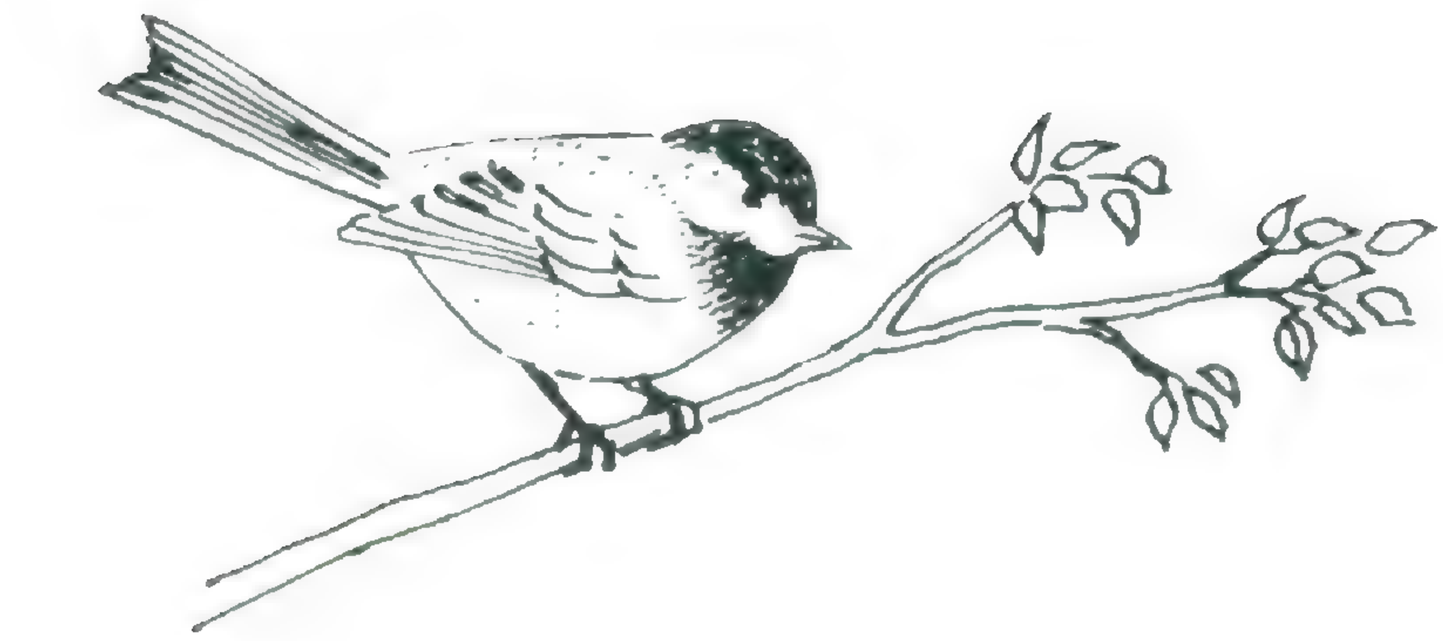
Not all of the spring arrivals leave the Garden, so summer birding might consist of looking for bird families. Cardinals, robins, song sparrows, house wrens, brown thrashers, mockingbirds, catbirds, yellow warblers, chickadees, downy woodpeckers, yellow-shafted flickers, titmice, bob-whites—these are a few that you will be more likely to see but there will be many others. It takes a sharp and patient eye to find any bird in lush summer foliage.

Two birds that formerly were seen quite commonly in the Garden are the bluebird and the European tree sparrow, that import so unique to the St. Louis area. Henry Shaw, writing about the bluebird about 1880, said, "The earliest harbinger of Spring, seen the first five days of March, a welcome visitor, and a destroyer of insects injurious to Gardens and Orchards." Mr. Shaw seemed quite sure of the date of this lovely Missouri state birds' arrival, but almost one hundred years later we cannot be sure of its arrival at all. It *has* been seen occasionally in the Garden in the last few years, but is most uncommon.



The European tree sparrow used to nest here but like the bluebird, has been pushed out and about by its pugnacious and stronger cousin, the too common house sparrow. Summer and year-round birding should include careful observation of all sparrow flocks, because one or more just might be the somewhat smaller and prettier European tree sparrow. Watch for the green or blue parakeet escapees often seen with the sparrows, too.

Winter birding in the Garden should be done with the ears as well as the eyes, as sounds seem especially loud and distinct in cool weather. Listen for the clear ringing songs of the Carolina wren and mockingbirds; the busy flurry created by Carolina chickadees, titmice, downy woodpeckers, and nuthatches as they eat their way from tree to tree; the sweet sounds of white-throated sparrows, tree sparrows, and purple finches; the nasal "tchap" of song sparrows and the metallic click of the slate-colored junco; the covey calls of the bob-white; the raucous warnings of blue jays as you approach their areas; the twitterings of goldfinches; the scratchings of fox sparrows; the sweet call of cardinals; the distinctive rappings and calls of each variety of woodpecker; the gurgle of the red-winged blackbirds; and the varied "chucks" and "caws" of the grackles, crows, and starlings. There are many others that birders hope to find on winter walks: pine siskins, red polls, field sparrows, towhees, white-crowned sparrows, red-breasted nuthatches, screech owls, great horned owls, red-tailed hawks, cedar waxwings, mourning doves, an occasional robin flock. Looking and listening for these and other species make winter birding days especially exhilarating.



Where should you look for the best birding at any season of the year? Birds may be anywhere in the trees, thickets, or shrubbery, and around any body of water, especially flowing streams and shallow puddles. There are certain favored places in the Garden where the greatest variety may be found. Among these are the small pool and the shrubbery west of the Climatron, the Knolls with its small stream, the various holly trees just west of the Knolls, the Mausoleum and the trees and shrubbery around it, the Lehmann Rose Garden and the nearby row of paper birch trees, the entire path through and around the North American Tract with its good variety of deciduous trees, its lake, and its thicket, just west of the new Lehmann Building. This thicket is interlaced with good paths and is a favorite stop-over spot for migrating warblers, kinglets, and vireos. Here you can develop a fine case of "warbler neck," a welcome muscular malady that strikes a birder in the spring and fall! In the winter this thicket and other shrubby areas are especially good cover for the bob-whites and wintering sparrows, grackles, and slate-colored juncos. Winter investigation should also be made of all of the Garden's fine seed and cone-bearing trees and plants.

The following is a composite list of birds, some quite unusual, that have been observed in the Garden during the last three years, by four different birders: Dr. John Mullins, who has birded in the Garden since his childhood; Miss Helen Bowman, a retired teacher and Tower Grove House volunteer; Mr. Tony McColl, an Audubon Society bird walk leader; and me. It is surely not a complete list of every bird that has been in or over the Garden, but should give you

some idea of the great variety that can be seen and enjoyed in this unique spot.

For people interested in further investigation of our area's birding possibilities, *A Guide to Finding Birds in the St. Louis Area* by Richard Anderson and Paul Bauer, is an excellent publication and is available at the Garden Gate Shop for $1.10.

BIRD LIST, 1969-1971

Loons:
- Common Loon

Grebes:
- Pied-billed Grebe

Herons, Cranes, and Allies:
- Great Blue Heron
- Green Heron
- Coot
- Virginia Rail

Waterfowl:
- Canada Goose
- Mallard Duck
- Wood Duck

Hawks:
- Red-tailed Hawk
- Sparrow Hawk

Quail:
- Bob-white

Shorebirds:
- Killdeer
- Spotted Sandpiper

Pigeons and Doves:
- Rock Dove (Domestic Pigeon)
- Mourning Dove

Cuckoos:
- Yellow-billed Cuckoo
- Black-billed Cuckoo

Owls:
- Screech Owl
- Great Horned Owl

Goatsuckers:
- Nighthawk

Swifts:
- Chimney Swift

Hummingbirds:
- Ruby-throated Hummingbird

Kingfishers:
- Belted Kingfisher

Woodpeckers:
- Yellow-shafted Flicker
- Red-bellied Woodpecker
- Red-headed Woodpecker
- Yellow-bellied Sapsucker
- Downy Woodpecker
- Hairy Woodpecker

Flycatchers:
- Eastern Kingbird
- Great-crested Flycatcher
- Eastern Phoebe
- Yellow-bellied Flycatcher
- Least Flycatcher
- Eastern Wood Peewee

Swallows:
- Tree Swallow
- Barn Swallow
- Purple Martin

Jays and Crows:
- Blue Jay
- Crow

Titmice:
- Caroline Chickadee
- Tufted Titmouse

Nuthatches:
- White-breasted Nuthatch
- Red-breasted Nuthatch

Creepers:
- Brown Creeper

Wrens:
- House Wren
- Winter Wren
- Carolina Wren

Mimic Thrushes:
- Mockingbird
- Catbird
- Brown Thrasher

Thrushes:
- Robin
- Wood Thrush
- Hermit Thrush
- Swainson's Thrush
- Gray-cheeked Thrush
- Veery
- Eastern Bluebird

Gnatcatchers and Kinglets:
- Blue-gray Gnatcatcher
- Golden-crowned Kinglet
- Ruby-crowned Kinglet

Waxwings:
- Cedar Waxwing

Starlings:
- Starling

Vireos:
- White-eyed Vireo
- Warbling Vireo
- Solitary Vireo
- Red-eyed Vireo
- Philadelphia Vireo
- Yellow-throated Vireo

Wood Warblers:
- Black and White Warbler
- Blue-Winged Warbler
- Tennessee Warbler
- Orange-crowned Warbler
- Nashville Warbler
- Parula Warbler
- Yellow Warbler
- Magnolia Warbler
- Black-throated Blue Warbler
- Myrtle Warbler
- Black-throated Green Warbler
- Blackburnian Warbler
- Yellow-throated Warbler
- Chestnut-sided Warbler
- Bay-breasted Warbler
- Blackpoll Warbler
- Pine Warbler
- Palm Warbler
- Ovenbird
- Louisiana Waterthrush
- Northern Waterthrush
- Yellowthroat
- Hooded Warbler
- Wilson's Warbler
- Canada Warbler
- American Redstart
- Cape May Warbler

Weaver Finches:
- House Sparrow
- European Tree Sparrow

Blackbirds and Orioles:
- Eastern Meadowlark
- Red-winged Blackbird
- Rusty Blackbird
- Baltimore Oriole
- Common Grackle
- Brown-headed Cowbird

Tanagers:
- Scarlet Tanager
- Summer Tanager

Grosbeaks, Sparrows, Finches, and Buntings:
- Cardinal
- Rose-breasted Grosbeak
- Indigo Bunting
- Purple Finch
- Common Red Poll
- Pine Siskin
- American Goldfinch
- Rufous-sided Towhee
- Slate-colored Junco
- Oregon Junco
- Tree Sparrow
- Chipping Sparrow
- Field Sparrow
- White-crowned Sparrow
- White-throated Sparrow
- Fox Sparrow
- Swamp Sparrow
- Song Sparrow

Parrots:
- Domestic Parakeet

Spring Flowers at the Arboretum

March & April

Duncan M. Porter

EARLY SPRING is one of the most pleasant times of year to hike in the Arboretum at Gray Summit. The woodland wildflowers and a few shrubs and small trees are beginning to poke their flowers out into the crisp air, and other hikers are few. Most early wildflowers of the forest begin to bloom before the first flush of leaves appears on the trees above them. They are pollinated in the light of spring, then fruit and wither under a roof of green.

To provide those who venture into the woods of the Arboretum at this time with a guide to the flowers they may see has been the impetus for this article. Simple keys are provided to the shrubs and small trees and the wildflowers that are likely to be encountered by the hiker on the Arboretum's trails. These two keys are constructed of numbered pairs of contrasting statements describing distinctive features of the plants. To use a key, read both statements in each pair, and follow the one describing the plant in hand, either to its correct name or to the next numbered pair of contrasting statements.

Following each key is an alphabetical list of the plants in the key. The lists give common name, scientific name, plant family, habitat, a specific locality in the Arboretum where a specimen ought to be found, and a note on some of the uses of the plant. Each locality or feature mentioned in the lists is indicated on the accompanying map of the Arboretum.

The reader seeking illustrations or further information about the plants should consult Dr. Julian Steyermark's *Spring Flora of Missouri* (1940) or his monumental *Flora of Missouri* (1963). Those interested in ferns should see Dr. Marshall Crosby's "An Introduction to the Ferns of the Arboretum" in the March-April 1971 *Bulletin*.

KEY TO FLOWERING SHRUBS AND SMALL TREES

1. Flowers white or green.
    2. Flowers appearing before the leaves, the leaves simple.
        3. Flowers small, green, crowded together and surrounded by four large, white, petal-like leaves . . . . . Flowering Dogwood
        3. Flowers not crowded together, each with five petals.
            4. Petals about as long as they are wide. . . . . Wild Plum
            4. Petals about twice as long as they are wide . . . . . Shadbush
    2. Flowers appearing after the leaves, the leaves with three leaflets . . Bladder-Nut
1. Flowers yellow or pink to purple or dark purple-brown.
    5. Flowers yellow, occurring in clusters at or near the ends of the branches.
        6. Flowers appearing before the leaves, the petals five or six.
            7. Petals five . . . . . Fragrant Sumac
            7. Petals (actually petal-like sepals) six . . . . . Spice Bush
        6. Flowers appearing after the leaves, the petals four . . . . . Buckthorn
    5. Flowers pink to purple or dark purple-brown, occurring along the branches.
        8. Petals five, not all of the same size and shape, the flowers pea-like. . . . . Redbud
        8. Petals three, all of the same size and shape, the flowers not pea-like. . . . . Pawpaw

LOCALITIES/USES OF FLOWERING SHRUBS AND SMALL TREES

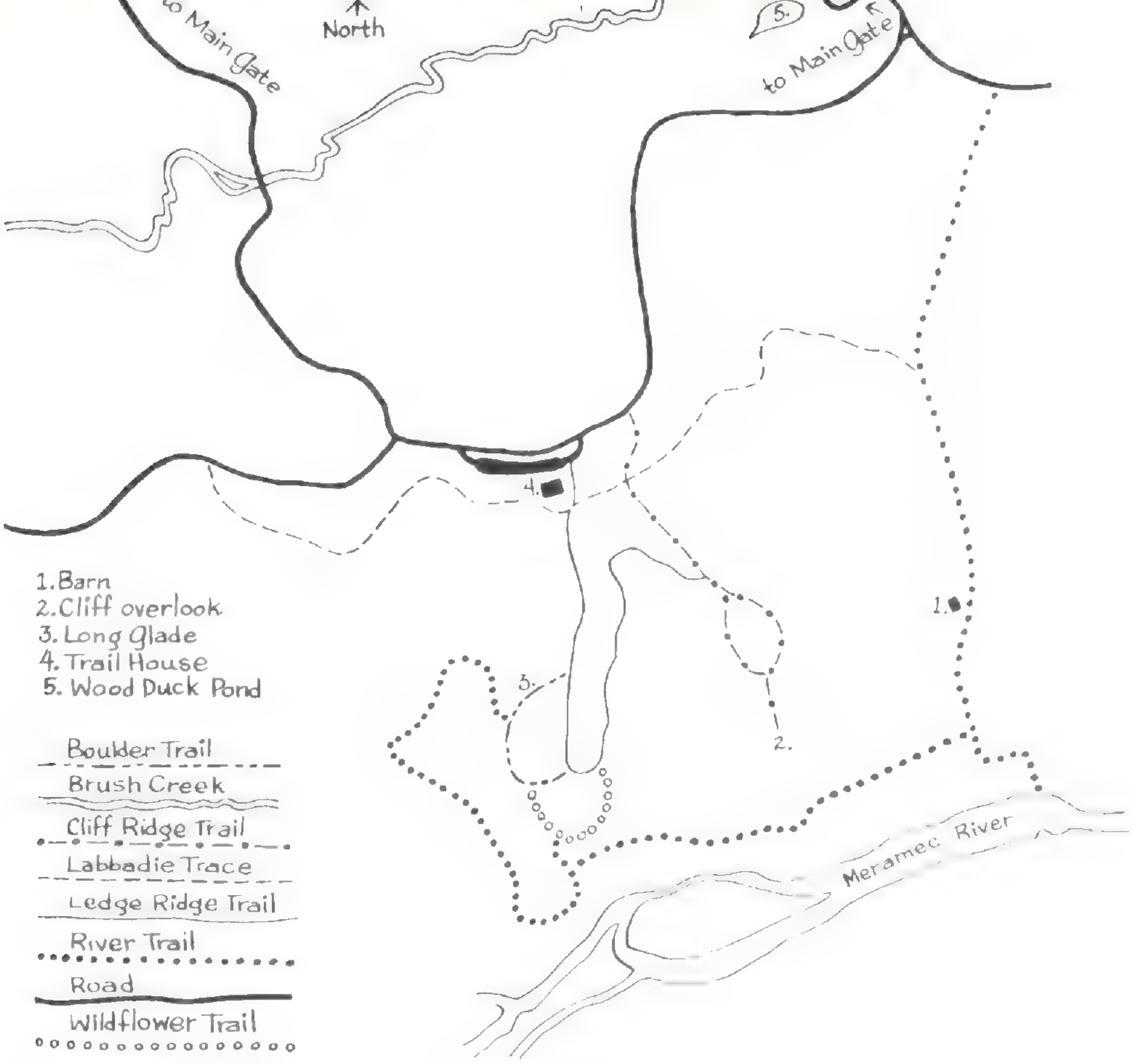
BLADDER-NUT *(Staphylea trifoliata*—Bladder-nut Family*)* occurs on shady, rocky slopes, such as that below the sandstone outcrop on the Wildflower Trail. The drooping clusters of white flowers are showy. The fruit, which matures in late summer, when squeezed yields a satisfying "pop."

BUCKTHORN *(Rhamnus lanceolata*—Buckthorn Family*)* is a plant of glade edges, and is to be sought on the periphery of Long Glade. As is true for the other members of its genus, the bark is quite cathartic.

FLOWERING DOGWOOD *(Cornus florida*—Dogwood Family*)* occurs in abundance throughout the upland woods. A number of specimens have been planted along Cliff Ridge Trail, including a few with rose-colored, rather than white, leaves surrounding the inconspicuous flowers. The bitter inner bark was onetime used as a substitute for quinine.

FRAGRANT SUMAC *(Rhus aromatica*—Cashew Family*)* will be encountered in rocky open woods. Several specimens will be found along the trail to Cliff Overlook. The mature berries can be used to make a refreshing lemonade-like drink.

PAWPAW *(Asimina triloba*—Custard Apple Family*)* occurs on



Map of wild flower trails at the Missouri Botanical Garden Arboretum, located at Gray Summit, Missouri

wooded slopes and flood plains along streams. A number of plants occur at the bases of the slopes where passed by the River Trail; they are easily recognized by their large, foot-long simple (unlobed) leaves. The edible fruits, delicious when mature, may cause dermatitis to the more sensitive.

REDBUD (*Cercis canadensis*—Pea Family) is common along the borders of the woods throughout the Arboretum. Several small trees will be found where the Labbadie Trace and Cliff Ridge Trail cross. The flowers are edible and may be used in salads or fried. A white-flowered form of this species may be seen where the road crosses Brush Creek near Wood Duck Pond.

SHADBUSH (*Amelanchier arborea*—Rose Family) is one of the first trees to bloom in the spring. It forms a shimmering white contrast to the surrounding brown leafless trunks in the upland forests. A fine specimen will be found alongside Ledge Ridge Trail, just before it meets Cliff Ridge Trail. The fruits, which mature in June and July, can be used for pies and puddings.

SPICE BUSH (*Lindera benzoin*—Laurel Family) is found in low, moist woodlands; look for it along the bases of the bluffs near the River Trail. When bruised, the twigs and leaves give off a spicy fragrance; they and the fruits may be brewed into a pleasant tea.

WILD PLUM (*Prunus americana* and *P. mexicana*—Rose Family) occurs in the rocky woods. Several have been planted amongst the Flowering Dogwoods along Cliff Ridge Trail. The two species at the Arboretum can be told apart because one (*Prunus mexicana*) has hairy branchlets, while the branchlets of the other (*P. americana*) are hairless. Both produce edible, plum-like fruits.

KEY TO THE WILDFLOWERS

1. Leaves narrow and grass-like.
    2. Flowers yellow or greenish.
        3. Flowers yellow, the petal-like parts six, the central part not elongated.
            4. Flowers several, bunched together at the top of the stalk . . . . . False Garlic
            4. Flowers one to several, not bunched together at the top of the stalk . . . . . Yellow Star Grass
        3. Flowers greenish, petals five, the central part elongated . . . . . Mouse Tail
    2. Flowers white, pink, or pale blue.
        5. Flowers pale blue, iris-like . . . . . Dwarf Wild Iris
        5. Flowers white or pink, not iris-like . . . . . Spring Beauty
1. Leaves not narrow and grass-like.
    6. Flowers pansy-like.
        7. Leaves heart-shaped.
            8. Leaves and stems hairy. . . . . Woolly Blue Violet
            8. Leaves and stems hairless . . . . . Common Violet
        7. Leaves not heart-shaped.
            9. Flower-bearing stems leafless, the leaves at the base of the plant and deeply dissected. . . . . Bird's Foot Violet
            9. Flower bearing stems with small tongue-shaped leaves deeply dissected only at their bases. . . . . Johnny-Jump-Up
    6. Flowers not pansy-like.
        10. Leaves lobed or toothed, or of three or more leaflets.
            11. Flowers yellow, yellow and white, or orange.
                12. Flowers bunched closely together at the tops of the stalks to form a flower-like inflorescence, of two kinds, the outer yellow and petal like, the inner small and brown. . . . . Golden Ragwort
                12. Flowers not bunched closely together into a flower-like inflorescence.
                    13. Flowers irregular (the petals not all the same size and shape).
                        14. Petals pale yellow, the flowering stems leafy . . . . . Pale Corydalis
                        14. Petals white tipped with yellow, the flowering stems not leafy . . . . . Dutchman's Breeches
            13. Flowers regular (the petals all the same size and shape).
                15. Petals four.
                    16. Petals orange, the plant with yellow sap . . . . . Wood Poppy
                    16. Petals pale yellow, the plant with clear sap. . . . . Toothwort

15. Petals five or more . . . . . Small-Flowered Buttercup
11. Flowers white, pink, or blue to purple.
17. Flowers hidden from view on the ground under the leaves . . . . . Wild Ginger
17. Flowers not hidden from view under the leaves.
18. Flower-bearing stems leafless.
19. Leaves three-lobed or of three leaflets.
20. Leaves of three leaflets.
21. The minute true flowers in a yellow pencil-like inflorescence covered by a large purple hood-like flap . . . . . Jack-In-The-Pulpit
21. Flowers large, exposed, with five white petals. . . . . Wild Strawberry
20. Leaves three-lobed . . . . . Hepatica
19. Leaves more than three-lobed or toothed.
22. Petals four, the plant with clear sap . . . . . Leavenworthia
22. Petals more than four, the plant with orange sap . . . . . Bloodroot
18. Flower-bearing stems with leaves.
23. Flowers irregular (hood-shaped or pea-like, not all the petals the same size and shape).
24. Flowers hood-shaped, purplish or pinkish, in whorls along the stem. . . . . Henbit
24. Flowers pea-like, cream-colored and blue- or lilac-tipped, in clusters at the ends of the stems . . . . . Ground-Plum
23. Flowers regular (not hooded or pea-like, all the petals the same size and shape).
25. Petals fused together at the base to form a five-lobed cup-like flower . . . . . Jacob's Ladder
25. Petals free from one another, not fused together.
26. Leaves only at the top of the stem in a whorl below the flowers . . . Rue Anemone
26. Leaves scattered along the stem, or only one below the flowers.
27. Flowers only one or several per stem . . . . . False Rue Anemone
27. Flowers many per stem, bunched in clusters.
28. Leaves all at the stem base except for one below the flower clusters . . . . . Harbinger of Spring
28. Leaves scattered along the stem.
29. Ultimate leaf divisions all of about the same size, the leaves hairless . .Wild Chervil
29. Ultimate leaf divisions of widely different sizes, the leaves hairy . . . Sweet Cicely
10. Leaves unlobed and untoothed, the edges smooth.

30. Flowers yellow, orange, or red.
31. Flowers yellowish, minute, the plant with white sap . . . . . Wood Spurge
31. Flowers yellow, orange, or red, showy, the plant with clear or red sap.
32. Flowers yellow.
33. Flowers hood-shaped, upright, surrounded by red or orange leaves . . . . . Indian Paintbrush
33. Flowers bell-shaped, hanging downward, not surrounded by red or orange leaves.
34. Bases of the leaves surrounding the stem . . . . . Bellwort
34. Bases of the leaves not surrounding the stem . . . Soloman's Seal
32. Flowers red or orange.
35. Flowers red, petals notched at the tip . . . . . Fire Pink
35. Flowers orange, petals rounded at the tip . . . . . Orange Puccoon
30. Flowers white, pink, or blue to purple.
36. Petal-like parts three or six, free from one another.
37. Leaves three, flowers upright . . . . . Purple Wake-Robin
37. Leaves two, flowers nodding.
38. Flowers white . . . . . White Adder's Tongue
38. Flowers bluish or lavender . . Prairie Adder's Tongue
36. Petal-like parts four or five, fused together for at least half their length.
39. Leaves alternating on the stem . . . . . Bluebells
39. Leaves opposite, in pairs, on the stem.
40. Petals five . . . . . Wild Sweet William
40. Petals four . . . . . Quaker Ladies

LOCALITIES/USES OF WILD FLOWERS

BELLWORT *(Uvularia grandiflora*—Lily Family*)* occurs in rich woods; it may be found in abundance along Ledge Ridge Trail just before it reaches Cliff Ridge Trail. The bell-shaped flowers are showy, and the shoots and roots are edible.

BIRD'S-FOOT VIOLET *(Viola pedata*—Violet Family*)* is a common glade species which occurs in abundance on Long Glade. Two varieties are present: in variety *linearíloba,* all five petals are the same color, from pale to deep purple or lavender; in variety *pedata,* the lower three petals are like the former, while the upper two are dark, velvety violet.

BLOODROOT *(Sanguinaria canadensis*—Poppy Family*)* will be found on rich or rocky wooded slopes. A good place to see it is along Ledge Ridge Trail where it is met by Boulder Trail. The root, which is poisonous in large doses, had many medicinal uses by the Indians.

BLUEBELLS *(Mertensia virginica*—Borage Family*)* is a plant of stream-side woods; several occur at the edge of the woods near Brush Creek where it is crossed by the road near Wood Duck Pond. The flowers are pink when they first open, soon turning bright blue. This is a good plant for the woodland garden.

COMMON VIOLET *(Viola papilionacea*—Violet Family*)* will be found along the trails through the woods. A number occur at the intersection of Ledge Ridge Trail and Labbadie Trace, just below the Trail House. The leaves are eaten by deer.

DUTCHMAN'S BREECHES *(Dicentra cucullaria*—Fumitory Family*)* occurs in rich or rocky woods—look for it along Ledge Ridge Trail. This species is poisonous to cattle.

DWARF WILD IRIS *(Iris cristata*—Iris Family*)* is a species from southern Missouri that has been introduced into the Arboretum. There are several large colonies along Boulder Trail in the woods below Long Glade.

FALSE GARLIC *(Nothoscordum bivalve*—Lily Family*)* occurs on glades, look for it on Long Glade. The bulb looks like a garlic, but doesn't smell like one, hence the common name.

FALSE RUE ANEMONE *(Isopyrum biternatum*—Buttercup Family*)* is a plant of stream-side woods; it occurs along the River Trail. The flowers lack petals, the white petal-like structures actually are sepals.

FIRE PINK *(Silene virginica*—Pink Family*)* occurs in rocky woods and on wooded slopes. A number will be found on the rocks along Boulder Trail below Long Glade, perhaps having been planted there. Members of this genus commonly are called the catchflies, because of the sticky glands that trap small insects on the stems below the flowers.

GOLDEN RAGWORT *(Senecio aureus*—Sunflower Family*)* will be found in rich, rocky woods, such as that along the Wildflower Trail near the sandstone outcrop. Deer eat the basal leaves during winter.

GROUND PLUM *(Astragalus mexicanus* var. *trichocalyx*—Pea Family*)* is a plant of rocky open woods. It occurs along Ledge Ridge Trail between the Trail House and Boulder Trail. The unripe fruits may be eaten raw or fried.

HARBINGER-OF-SPRING *(Erigenia bulbosa*—Parsley Family*)* is the earliest of our native wildflowers to bloom, often beginning in January. It occurs in rich woods, and is to be sought along Ledge

Ridge Trail below Boulder Trail. The root is edible.

HENBIT *(Lamium amplexicaule*—Mint Family*)* is the only plant in this list not native to Missouri; it was introduced early into the New World from Europe. It occurs in grasslands, abounding along the parking lot near the Trail House. Young plants may be eaten raw, or when older they may be boiled as potherbs.

HEPATICA *(Hepatica nobilis* var. *acuta*—Buttercup Family*)* occurs on rich wooded slopes; several clumps occur on the sandstone outcrop along the Wildflower Trail. The leaves are eaten during the winter by deer.

INDIAN PAINTBRUSH *(Castilleja coccinea*—Figwort Family*)* is a glade plant that has been planted on Long Glade, where it is quite common. It is a root-parasite, being attached to, and apparently obtaining nourishment from, the roots of the Blackeyed Susan, which blooms in the fall.

JACK-IN-THE-PULPIT *(Arisaema atrorubens*—Arum Family*)* occurs in rich woods, like those along Ledge Ridge Trail below its intersection with Cliff Ridge Trail. The roots are rich in starch but poisonous. The Indians got around the poison by mashing, washing, and drying the roots before eventually eating them.

JACOB'S LADDER *(Polemonium reptans*—Phlox Family*)* occurs in rich woods; look for it along Ledge Ridge Trail below its intersection with Boulder Trail. The root has been used as a diuretic.

JOHNNY-JUMP-UP *(Viola rafinesquii*—Violet Family*)* is a grassland plant, and is plentiful in the lawns near the Trail House. The roots may prove to be emetic.

LEAVENWORTHIA *(Leavenworthia uniflora*—Mustard Family*)* is a glade plant common on Long Glade. It is only a few inches high, so you may have to search for it.

MOUSETAIL *(Myosurus minimus*—Buttercup Family*)* is a grassland weed occurring in the large pasture along the River Trail below the Barn. Like the Leavenworthia, it is small and must be sought out, not being advertised by bright showy flowers.

ORANGE PUCCOON *(Lithospermum canescens*—Borage Family*)* occurs in rocky woods, such as those along Ledge Ridge Trail. The orange sap of the roots is pretty, but apparently of no importance to man other than esthetic.

PALE CORYDALIS *(Corydalis flavula*—Fumitory Family*)* occurs in rich low woods along streams; it will be found growing with Bluebells along Brush Creek, near Wood Duck Pond, where

it is crossed by the road. Another nice species for the wildflower garden.

PRAIRIE ADDER'S TONGUE *(Erythronium mesochoreum*—Lily Family*)* is found in rocky open woods and along the edges of glades. Seek it around the periphery of Long Glade.

PURPLE WAKE ROBIN *(Trillium recurvatum*—Lily Family*)*, a plant of rich or rocky woods, occurs in abundance along Boulder Trail below Long Glade and along Ledge Ridge Trail below its intersection with Boulder Trail. Leaves of members of this genus have been used as potherbs during hard times, but the roots are highly emetic.

QUAKER LADIES *(Hedyotis minima*—Coffee Family*)* is a grassland species to be looked for near the parking lot at the Trail House. It is small and easily overlooked.

RUE ANEMONE *(Anemonella thalictroides*—Buttercup Family*)*, a woodland plant, occurs along Ledge Ridge Trail. This species lacks petals, the petal-like structures in reality being sepals.

SMALL-FLOWERED BUTTERCUP *(Ranunculus abortivus*—Buttercup Family*)* will be found in moist woods; look for it on the wet slopes above the River Trail. This buttercup in the spring is fed upon by wild turkeys.

SOLOMAN'S SEAL *(Polygonatum canaliculatum*—Lily Family*)* occurs in rich or rocky woods, like those along Ledge Ridge Trail near its intersection with Cliff Ridge Trail. The young leafy shoots may be used as a substitute for asparagus.

SPRING BEAUTY *(Claytonia virginica*—Purslane Family*)* is a common woodland species throughout the Arboretum. Many may be found along Labbadie Trace. Young plants may be eaten in salads, while the starchy roots also may be boiled and eaten.

SWEET CICELY *(Osmorrhiza claytonii*—Parsley Family*)* will be found in rich woods, like those along Ledge Ridge Trail below Boulder Trail. The roots contain an anis-flavored oil that can be used as a flavoring.

TOOTHWORT *(Dentaria laciniata*—Mustard Family*)* occurs in rich woodlands with such plants as Sweet Cecily. The pungent root may be used as a substitute for horseradish.

WHITE ADDER'S TONGUE *(Erythronium albidum*—Lily Family*)* grows in rich woods in situations similar to the preceding two species. Some members of this genus are eaten, but apparently not this one.

WILD CHERVIL *(Chaerophyllum procumbens*—Parsley Family*)* occurs in rich woods; look for it along Ledge Ridge Trail below Boulder Trail. Like the true Chervil, this plant probably would make an interesting addition to a green salad.

WILD GINGER *(Asarum canadense*—Birthwort Family*)* is a plant of rich wooded slopes with plenty of humus. The brownish-purple flowers often are not only under the leaves, but under the leaf mold as well. The fresh or dried roots may be used as a substitute for ginger.

WILD STRAWBERRY *(Fragaria virginiana* var. *illinoensis*—Rose Family*)* grows along the margins of woods, and is common along Ledge Ridge Trail between Boulder Trail and Cliff Ridge Trail. The fruits are edible, and are preferred by some to the cultivated Strawberry.

WILD SWEET WILLIAM *(Phlox divaricata* var. *laphamii*—Phlox Family*)* occurs in rich woods, and is common throughout the Arboretum. One spot to see masses of this species is along the River Trail below the Barn. It is fed upon by deer, ruffed grouse, and prairie chicken.

WOOD POPPY *(Stylophorum diphyllum*—Poppy Family*)* is a plant of rich woods that has been introduced into the Arboretum. It may be found along Ledge Ridge Trail below its intersection with Boulder Trail. This would make a showy garden plant.

WOOD SPURGE *(Euphorbia commutata*—Spurge Family*)* is found in rich or rocky woods; many plants will be found along Boulder Trail near its intersection with Ledge Ridge Trail below Long Glade. The milky sap may cause dermatitis.

WOOLLY BLUE VIOLET *(Viola soraria*—Violet Family*)* occurs in rocky or dry open woods. It is common along the loop at the end of Cliff Ridge Trail. The leaves are eaten by deer.

YELLOW STAR-GRASS *(Hypoxis hirsuta*—Star-grass Family*)* is a glade plant, to be pursued on Long Glade. The delicate, yellow flowers would be the perfect addition to a rock garden. □

What's Going on at the Garden?

Annual Meeting, Board of Trustees

THE BOARD OF TRUSTEES of the Missouri Botanical Garden held its annual meeting January 19, 1972.

C. Powell Whitehead was re-elected president of the Board. He has served on the Board since 1965. Mr. Whitehead was, before his retirement, president and chairman of the board of General Steel Industries, Inc. He has served as chairman of the board of directors of the Arts and Education Council of Greater St. Louis, and president of the United Fund of Greater St. Louis. In recognition of his civic achievements, Mr. Whitehead received the Glove-Democrat Man-of-the-Year Award in December, 1968.

Tom K. Smith, Jr. was re-elected first vice president of the Board of Trustees. He first became a member of the board in 1963. Mr. Smith is managing director of Monsanto Commercial Products Company, an operating unit of Monsanto Company, and is a corporate vice president and member of the board of directors. He is a board member of the Arts and Education Council, Loretto Hilton Theater, Inc., and St. Louis Symphony Society. Mr. Smith has, for the past several years, been active in fund raising for the United Fund and the Arts and Education Council.

Joseph H. Bascom has been elected second vice president of the Garden's Board of Trustees. He was appointed a member of the Board in 1971. Mr. Bascom is chairman of the board of Broderick and Bascom Rope Company, a subsidiary of Keystone Consolidated Industries. He is a member of the board of directors of General Steel Industries, Inc., St. Louis Union Trust Co., Mississippi River Corporation, and Missouri Historical Society.

Sydney M. Shoenberg, Jr., has been elected to the Board of Trustees. He succeeds the late Leonard J. Holland. Mr. Shoenberg is vice president of Sydney M. Shoenberg and Company. He has been a member of the Jewish Hospital board of directors for many years and in recognition of his years of service, has been selected as a life member of the hospital's board of directors. Mr. Shoenberg is president of Shoenberg Foundation, Inc.

David Mitter, controller and business manager of the Missouri Botanical Garden, was elected secretary-controller of the Board of Trustees at the annual meeting. □

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THE MISSOURI BOTANICAL GARDEN . . .

. . . one of the world's leading botanical gardens and botanical research centers, occupies seventy acres in the heart of St. Louis. The Garden was established in 1858 by a prosperous St. Louis merchant, Henry Shaw, and is known locally as Shaw's Garden. The Garden, a non-profit institution, relies for support solely upon contributions from the public, the Arts and Education Council, and income from the Shaw estate. The Garden receives no city or state tax support.

The Garden contains many fine display greenhouses including the world-famous Climatron, extensive collections of orchids, water lilies, camellias, and roses. The Floral Display House is the setting for the Garden's major seasonal flower shows, as well as floral and plant displays by horticultural societies.

Courses in botany, natural history, and horticulture for adults and children are conducted by the Garden staff. Volunteer guides are available for tours of the Garden.

The Garden is open every day of the year except Christmas and New Year's Day from 9 a.m. to 6 p.m. May through October, and 9 a.m. to 5 p.m. November through April. On Sundays and holidays throughout the year the Garden remains open until 5 p.m.

Visitors may easily reach the Missouri Botanical Garden by auto and public transportation. It is only a short distance from major hotels and residential areas; south of Highway #40 and east of Kingshighway, on Tower Grove Avenue between Magnolia and Shaw.

The Missouri Botanical Garden Arboretum and Nature Reserve, 2200 acres of rolling Ozark plateau and Meramec River valley, established at Gray Summit, Missouri in 1926, is open to the public.

Support your Missouri Botanical Garden and take part in its activities through a membership in the Garden. Membership benefits include this Bulletin, the Newsletter, discounts on courses, invitations to special events, complimentary admission to the Garden and Tower Grove House, free horticultural advice, and involvement with a very important St. Louis institution.

Information about membership may be obtained from the Main Gate, by mail, or telephone (314-865-0440).

Missouri Botanical Garden
2315 Tower Grove Avenue
St. Louis, Mo. 63110

MISSOURI BOTANICAL GARDEN

BULLETIN

VOLUME LX NUMBER 3

MAY-JUNE 1972

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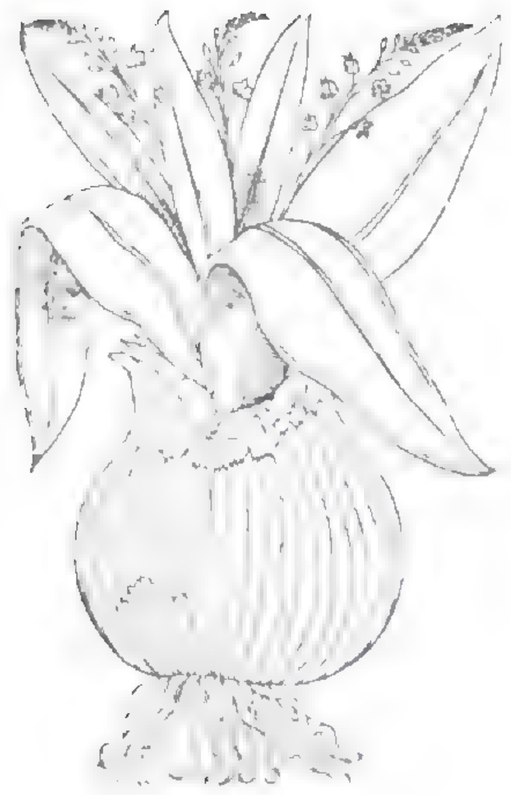

The Sea Onion (cover)

Carla Lange

THE COVER illustration of this *Bulletin* is the sea onion *(Uriginea maritima)*, formerly called *Scilla maritima*, a member of the lily family, taken from a woodcut in Hieronymus Bock's *Kreüterbuch* published in 1546.

The sea onion is a native of the countries bordering the Mediterranean on both sides, as well as of Brittany and Normandy; it has been found growing in very sandy seashores as well as a hundred miles inland.

The sea onion is a semi-hardy plant which blooms as early as July and August, bearing numerous flowers of a whitish, yellowish or rose color; its leaves, however, appear much later in October and November. The root or bulb is globular, of a very large size and grows half above the ground. To cultivate this plant, the seed should be sown in autumn on rich friable soil in shallow boxes in the same manner as hyacinth.

The roots or bulbs of the sea onion are the only parts used for medicinal purposes. The powder obtained from the dried root has proven to be a powerful diuretic and is also used for treating asthma as well as dropsy. Its taste is very bitter and acrid, but it has no noticeable smell. The bulb contains an active principle scillitin which has been used in medicine from a very remote period. The medicinal properties of the sea onion were well known and used by the ancients; it was used by Hippocrates externally and Pliny states that Pythagoras is supposed to have written a dissertation on its virtues. It was held in high esteem by the Egyptians as a remedy in heart diseases since its effect is similar to that which we now know as digitalis.

Bock himself says in his herbal that the juice derived from boiling the bulb of this plant is certain to kill mice and rats. In South Africa, the Zulus rub the cut surface of the bulb on skins laid out to dry to prevent damage by wild dogs. A dog licking such a skin is said to vomit profusely. However, the sea onion is not poisonous enough to seriously harm any larger animals. □

MISSOURI BOTANICAL GARDEN BULLETIN

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St. Louis Gardening

May and June

Robert J. Dingwall

THIS IS ONE OF the busiest periods of the year in the garden, and careful preparations now will pay off in good results for the rest of the growing season.

Flowering shrubs should be pruned immediately after flowering to control and shape the size of the individual plants. Azaleas that have become leggy can also be cut back after flowering to encourage new growth and more flowering. Azaleas have their root systems near the surface of the soil so should not be cultivated around the base. Fertilize these with a suitable fertilizer such as cotton seed meal and reapply mulch to conserve moisture and prevent weeds. Mulch should be applied around other shrubs and trees, especially around those newly planted.

Now, with the advent of warmer weather, the mower should be raised so you are cutting the grass no closer than 2"-2-1/2". This insures better grass due to more foliage needed to manufacture

food. Denser longer foliage also shades weed seeds, thus preventing their germination.

Annuals add quick color to the garden. Buy healthy plants and prepare the soil well by incorporating organic humus and bonemeal to the soil as you work it. Water plants well and keep moist until well established. Gladiolus bulbs planted at three week intervals will give a constant supply of cut flowers later in the season.

For that shady spot of the garden try planting impatiens, coleus, or caladiums to give color and interest. Prepare soil as recommended for annuals.

Be aware of insect and disease problems. Check the garden regularly and rogue out infected or weak plants. Many insects can be controlled by hand picking or washing off, if only a few insects are present. Only in heavy infestations are sprays called for, and then follow directions and use with extreme care. Apply in early morning when there is little or no wind. If spraying is necessary, use rotenone and pyrethrum as they are least toxic to humans and animals.

Roses are growing well and need good nutrition and moisture. Feed roses every six weeks with blood meal using one cupful to each plant. Work the blood meal into the soil lightly and give each plant about two gallons of water. Avoid wetting foliage, particularly late in the day as this encourages mildew. Benlate has proved very successful in the St. Louis area in controlling blight on roses. It is important to practice a good program of spraying so that new foliage is covered on a regular basis. Remove spent blooms to prevent seed formation and encourage new growth and better blooms.

Dwarf perennials such as arabis, alyssum, and candytuft should be cut back immediately after flowering to prevent the plants from becoming leggy. Work bonemeal into the soil around the roots following this shearing.

Early flowering perennials such as columbines, spring bulbs, peonies, and others should have old flower heads removed before they have a chance to set seeds. This allows all nourishment to go back into producing strong tubers, bulbs, and roots, and will insure better flowering the following year.

The foliage of spring flowering bulbs should not be cut off until it starts to yellow. If foliage is removed too early, the bulbs are not able to manufacture enough food to produce a large enough bulb for flowering next spring.

Hardy mums should be lifted and divided, or mum cuttings should be made in late May. Set these out in areas for fall flowering. Pinch tops back at this time to encourage branching and prevent the plants from getting leggy.

Ground covers such as euonymus, ivy, pachysandra, and myrtle should be mowed back by raising mower up to four to six inches to prevent the plants from becoming leggy and coarse. To obtain this height it may be necessary to purchase a set of larger wheels for your mower.

House plants will do well if they are taken outdoors for the summer and plunged into the ground in an area where they get sun during the morning or afternoon. Cut back if leggy and feed regularly. Repot as needed.

Tomatoes may be set out in mid-May if weather is suitably warm. Stake plants to keep them off the ground. After plants are established apply mulch to control moisture and prevent weeds.

Visit your Missouri Botanical Garden regularly for new ideas and information. □

The John S. Lehmann Building

A New Era for the Missouri Botanical Garden

THE DEDICATION of the John S. Lehmann Building on May 12, 1972 will culminate many years of hard work by thousands of devoted friends and employees of the Missouri Botanical Garden. In this beautiful new building, the Garden's world-famous library and herbarium, both among the leaders in North America, will be housed in modern and functional surroundings. In addition, the education program will be conducted in adequate facilities for the first time, with attractive new classrooms and a spacious attached green-

house. A 275-seat auditorium in the building will likewise be available for meetings of many kinds. Outwardly, the one-way reflecting glass walls of the building will reflect the garden, while those inside can look out on the same lovely scenes.

The need for a new facility to house the precious herbarium and library collections properly had been growing for years when the necessary catalyst for action arrived in the person of David M. Gates, who was appointed Director of the Missouri Botanical Garden in 1965. In 1966, a planning grant for the building in the amount of $14,500 was awarded. By 1968, the original plan of building an annex onto the Administration Building to provide additional space for the herbarium and library was abandoned in favor of the concept of a wholly separate building within the Garden. A proposal requesting funds for such a structure was submitted to the National Science Foundation, which had made the original planning grant.

In the fall of 1967, the Board of Trustees decided to conduct a capital fund drive with a goal of $3 million, not including the grant pending with the National Science Foundation. The President of the Board, Harry E. Wuertenbaecher, Jr., was appointed general chairman for the drive, with C. Powell Whitehead acting as vice-chairman. The chairman of the Advance Gifts Division was Warren Shapleigh, and there were three co-chairmen of the Special Gifts Division: Howard F. Baer, Clarence C. Barksdale, and George Erker. Donald E. Lasater was chairman and Tom K. Smith, Jr., vice-chairman of the Business Division.

During the summer of 1968, a series of luncheons was held for the community leaders of St. Louis at the Garden to describe our needs and to point out the national value of this fine institution. While some advance solicitation of major companies was begun in late 1968, the actual kick-off of the Capital Fund Drive came in January, 1969, with a luncheon at the Bel Air East. Dr. William C. Steere, then Director of The New York Botanical Garden, spoke, reminding us of the two great botanical institutions in our country, The New York Botanical Garden and our own Missouri Botanical Garden. For well over a year, members of the Board of Trustees, Garden employees, and many interested members of the St. Louis community showed their belief in the Missouri Botanical Garden by giving generously of their time and money.

RESOLUTION

IN MEMORY OF MR. JOHN S. LEHMANN

It is with great regret and a real sense of personal loss that the Trustees of Missouri Botanical Garden record the death on October 26, 1967, of their Honorary Trustee, Mr. John S. Lehmann.

By unanimous direction of the Board of Trustees, this page has been set aside in Mr. Lehmann's honor.

Mr. Lehmann was elected a member of the Board of Trustees on December 18, 1940. He served as President of the Board from 1953 to 1958. In 1965, he became an Honorary Trustee. For a brief period, Mr. Lehmann also served as acting Director of the Garden.

Mr. Lehmann devoted much of his time and attention to the affairs of the Garden, and supported these efforts by extremely generous financial contributions.

During Mr. Lehmann's administration, The Historical Committee was created. This Committee was responsible for the magnificent rehabilitation of Shaw House, which is a great attraction to the many visitors to the Garden. Further, Mr. Lehmann made it possible for the National Council of The Federated Garden Clubs of America to be located at the Garden.

It is impossible to record here Mr. Lehmann's many contributions to the welfare and development of the Garden during his many years of service. It is also difficult to find an adequate expression of the genuine esteem and affection which the Trustees had for Mr. Lehmann.

THE BOARD OF TRUSTEES
MISSOURI BOTANICAL GARDEN

In January of 1970, Hellmuth, Obata & Kassabaum, Inc., Architects, were commissioned to design the new structure, and in May, their concept was enthusiastically received and approved by the Board of Trustees. More than 1400 individuals, businesses, and foundations contributed to the total of $3,078,000, which was announced at the victory luncheon in April, 1970. In May, 1970, an award of $600,000 from the National Science Foundation was announced. At the groundbreaking for the new complex on December 7, 1970, the dedication of the library-herbarium-education building to the memory of John S. Lehmann was revealed to the public.

Mrs. John S. Lehmann, with David M. Gates, Director of the Garden, and C. Powell Whitehead, President of the Board of Trustees, symbolically planted a cluster of pachysandra, which will be used in broad beds around the building.

Mr. Whitehead said, "John S. Lehmann consistently made outstanding contributions to the Garden, both financially and through professional service. His interest and dedication to the furtherance of botanical and horticultural knowledge are manifest throughout the Garden today. It is most appropriate that this building, which will constitute a significant expansion of our educational facilities, bear his name."

John S. (Jack) Lehmann's (1886-1967) love of horticulture and botany began early when, as a boy, he spent his summers on his grandfather's farm in Iowa. In 1925, the year he married Anne S. Lionberger, Jack Lehmann bought a farm in Ladue where he soon developed extensive plantings of fruit trees and roses. He soon became one of St. Louis' experts on roses and their history, aided and encouraged by his wife who shared his deep love for the land. It was through these interests that he became so close to the Missouri Botanical Garden.

Mr. Lehmann became a prominent St. Louis lawyer, but he always saved time to serve the Garden, as a member of the Board of Trustees from 1940 through 1957, spending five of these years as President of the Board. He later became Acting Director of the Garden. Mr. Lehmann contributed significantly to the Climatron and heavily endowed the Lehmann Rose Garden. Following his death in 1967, Mrs. Lehmann has continued his long tradition and devotes a great deal of her interest to the Garden.

Hercules Construction Company was selected as general contractor for the Lehmann Building, and the completion date was scheduled for May 1, 1972. It has been thrilling to watch the building take shape, especially at such times as November, 1971, when the silver-glazed glass walls were installed. The building reflects the Administration Building and double row of dawn redwoods to the east and, Tower Grove, the Lake Como style country home of founder Henry Shaw, on the north. All in all, it provides a bright new focus for the Garden, as it looks forward to being an important part of the St. Louis community in the twenty-first century, as it has been in the nineteenth and twentieth centuries. St. Louis can be very proud of its Missouri Botanical Garden, which has a high national and international reputation.

The unified design of the building contains the library, herbarium, and education sections as distinct centers in a two-level, 52,000-square-foot complex. Six modular units are integrated through the use of common building materials, cast concrete and silver-glazed glass. The complex also contains a number of high-interest areas, including a specially appointed rare book room and a display area featuring the plants of Missouri.

The library, all of which is housed on one level, has a reading room-bibliography area, cataloging room, rare book room, librarian's office, photocopy room, bindery, and shelving for approximately 125,000 volumes.

The herbarium, which is housed on both levels of the Lehmann Building, has offices, laboratories and workrooms, as well as a completely new system of storage for the extensive preserved plant collections of the Garden. Bright orange steel compactors will house the 2.2 million specimens of dried plants. Called compactors because of the way in which they make the most of available space, these metal storage cabinets that slide open and shut upon steel tracks will multiply the herbarium's storage space by almost half, yet they will occupy only one-fifth more space than the system previously used.

The education department's major advantage in the new building is that it no longer must borrow space from other departments. The education wing includes a multipurpose auditorium, two classrooms, a workroom, office, greenhouse, and restroom facilities. It is now possible to seat 275 people comfortably. The thousands of

Claude Johnston

Mrs. John S. Lehmann, with Dr. David M. Gates, former Director of the Garden (left), and C. Powell Whitehead, President of the Garden's Board of Trustees (right), symbolically planted a cluster of pachysandra at the groundbreaking ceremony for the new Lehmann Building.

school children plus hundreds of adults who take the classes offered by the Garden in botany and horticulture annually will now be able to enjoy comfort and convenience.

As Mr. Whitehead, President of the Board of Trustees of the Missouri Botanical Garden has said, "The new library-herbarium-education building will enhance the Garden's position as a scientific, educational, and cultural institution. The magnificent new Lehmann Building is a tribute, not only to the memory of John S. Lehmann, but also to the excellence of the Missouri Botanical Garden and the many men and women who, over the years, have contributed so much to its worth as a world-famous botanical institution. It is a tribute also to the people of St. Louis who have pledged over three million dollars plus countless hours of time to the Garden. It is this kind of fai'h that will keep the Missouri Botanical Garden in the front ranks of botanical institutions of the world in years to come."

Roses, the Favorite Flowers

Robert J. Dingwall

MOST ROSES will grow and flower with relatively little attention. However, they will give much better results in both size and beauty for a number of years with a little extra care. This is well within the scope of the average gardener even if he is growing roses for the first time.

Site is very important to successful rose gardening. Avoid planting near hedges or under tall trees because of both shade and root competition. Most roses attain normal growth when they get full sun for at least half a day. Roses with richly colored flowers will look better if they have morning sun than afternoon sun, because the colors of many roses burn, bleach or become unattractive in one afternoon's exposure to intense sun and high temperature.

An average soil will support roses, but the better the soil the less preparation is needed to make it acceptable. Therefore, choose the best soil provided the location fits into the plan for the layout of the garden. Good drainage is vital for healthy roses; therefore avoid low areas that collect and hold water.

Soil preparation should be made well in advance of planting; i.e., fall for spring. Beds are prepared by digging the whole area, mixing in humus and fertilizer in the process. Nearly all soils will benefit by the addition of up to four inches of compost, peat moss, or other forms of organic matter such as well-rotted manure. Mix this thoroughly into the top twelve inches (two feet would be even bet-

ter). Add agricultural lime if a soil test indicates a strong acid condition, but do not add lime to an alkaline soil. Little plant food is needed at first by rose bushes. Organic plant foods are good, as they supply a slow release of nutrients.

Dormant roses may be planted in fall or early spring. Avoid buying plants with excessive growth as these will be weak. When bare-rooted plants are unpacked, plunge their roots into a pail of water. Cut off dead or broken roots and decayed or twiggy shoots. If the stems are shriveled, leave the whole plant in water for several hours as it will usually freshen up.

Make the hole for planting fifteen to eighteen inches wide and no deeper than required to bring the bud union (the bulge where the main stem has been grafted to the root stock) about level with the soil surface. Make a mound of fine soil in the middle of the hole. Hold the bush in the center of the hole and spread the roots out without bending or twisting them. Work in plenty of fine soil with the fingers, shaking the bush a little so that the soil falls through the roots and there are no air gaps left. Fill in more soil until the hole is half full and press it down firmly all around with the foot. Pour a bucket of water around each bush. After this settles, replace the rest of the soil. When finished the bud union should be level with the surface or not more than one inch below it.

Newly planted dormant roses need protection against drying. Hills of soil, drawn up around the stems to a height of about eight to ten inches is best. This mounded soil can be left all winter or, in the case of spring planting, until new growth has sprouted.

Potted roses may be planted at any time to fill in gaps in rose beds. Choose healthy vigorous plants having two or more stems. Planting is not difficult provided the ball of soil around the roots is kept intact during the process.

Roses need plenty of water when the season is dry. It should be applied, not in small daily doses, but at weekly intervals in quantities large enough to reach the deepest roots. Watering done in the morning of a sunny day is less likely to cause mildew than if it is done in the evening when foliage may remain wet overnight. Recommended practice is to let the water dribble slowly from the hose under the bush rather than use a spray over the foliage.

Do not use commercial fertilizers on newly planted roses for a couple of months, which will give their roots a chance to start grow-

The perfection of bloom in hybrid tea roses make them a favorite for both gardeners and flower arrangers.

ing. Main elements needed are nitrogen, phosphorus, potash, and, to a lesser extent, minor or trace elements such as magnesium. All chemical fertilizers should be regarded as supplementary to organic materials.

On established roses (one year or more after planting), when growth is well developed, it is a good idea to apply bloodmeal using one cup to each bush. This is worked lightly into the soil around each bush. Repeat every six weeks. If, as the season advances, more feeding is needed, use a liquid fertilizer and water well around the plants. Repeat only as needed. You can easily recognize healthy plants by their vigorous growth and good color patterns. Do not feed after September 1, unless bonemeal is used.

In preparing roses for the winter it is wise after the first heavy frost to cut back lengthy growth to prevent it from breaking in winter storms. At this time incorporate one cup of bonemeal or superphosphate around each plant. Rose roots continue to grow as long as the ground is not frozen, and as this fertilizer breaks down slowly, roses are able to absorb it and store it for next spring's growth.

To protect roses from freezing it is wise to heel them up with soil once the leaves have started to drop. Many materials can be used for this, but the best is well-rotted compost. Eight to ten inches should be mounded around each bush. There are many methods of protecting roses from freezing, such as rose covers or wire frames, and if you have a successful method that has worked for you, continue to use it.

In the spring when the temperature starts to warm up and heavy frosts are over, the mulch around the roses should be gradually removed. If you have used the compost above, gradually spread this out over the area around the roses leaving it on the bed. Once it is all levelled, work it in lightly so as not to tear up the roots of the roses. At this time add one cup of bonemeal to each plant. By leaving the compost on the beds you are insuring a good supply of organic material for your soil which will supply needed foods and trace elements necessary for healthy plants.

Weak plants are subject to pests and diseases, but healthy plants may also have some problems. Sanitary measures are important. Remove weak or diseased stock, and replace their soil with fresh. Remove all old leaves and blooms. The rose's main pests are aphids, mites, and chewing insects, and its major diseases are black spot,

mildew, and canker. Benlate, a new product, has proven very successful in controlling black spot and mildew. Morestan is good for mite control. Use both with care.

Blackspot may appear just as yellowish areas, irregular circular spots that darken later. It will infect lower leaves first.

Mildew usually starts on new growth as a whitish coating. Leaves curl or become crippled.

Canker is a disease on stems. Areas of bark turn brown and when they encircle the stem, it dies. It usually enters the stem through injury and frost damage. Prune back to good wood.

Claude Johnston

The formal rose garden just south of the Linnaean House has many cultivars of roses in a dazzling display that ranges from the purest white through orange and pink to the deepest crimson.

Roses should be cut late in the day, unlike other flowers which last longer when cut early in the morning. A rose cut after 4:30 p.m. will last ten hours longer than one cut at 8:00 a.m. The reason for this is thought to be the extra supply of sugar in the leaves late in the day.

Roses are pruned in the spring when new shoots are about one-fourth inch long. Buds near the top of stems grow first so that, when stems are left long, branches will be high above the ground; conversely, short pruning of stems induces basal branching. The shape of a bush may be controlled to some extent by pruning which aims to force new stems to grow away from the center of the plant. It is desirable to open up the center to admit light and air.

Since it takes five to seven leaves (not leaflets) to produce enough food for each bloom, leave the plant enough foliage to grow and produce blooms in a normal manner.

Visit your Missouri Botanical Garden to see what roses do best for this area and to find answers to your rose questions. Support your local rose club! □

The Hardiest of Oranges

Duncan M. Porter

ONE DOES NOT EXPECT to find oranges growing out of doors at this latitude, and it is always a shock to me to come upon this tree in the northeastern corner of the Linnaean Garden. It is the hardy orange or trifoliate orange, a native of central and northern China.

The hardy orange has been cultivated in China as an ornamental tree or shrub for thousands of years, and in Japan since at least the eighth century A.D. It was early introduced into Europe, and in 1753 Linnaeus, from whom dates modern botanical nomenclature, placed the hardy orange in the same genus with its closest relatives, the citrus fruits, naming it *Citrus trifoliata*. The brilliant, but erratic French-American botanist from Constantinople, Constantine S. Rafinesque, in 1838 placed the species in its own genus, *Poncirus*. Today the hardy orange is known scientifically by the name Rafinesque gave it, *Poncirus trifoliata*. This genus is what is called *monotypic*, that is *P. trifoliata* is the only species that it contains.

This spiny shrub or small tree is easily distinguished from the true citrus species. It has deciduous leaves composed of three leaflets; scale-covered flower buds are formed in the summer and open the following spring before and at the same time as the leaf buds; white flowers two to three inches in diameter are borne on the wood of the previous year's growth; and the golfball sized orange-like fruits are almost totally inedible to humans. The 16 or so species of *Citrus* have evergreen leaves with a single leaflet; flower buds are not scale-covered, but flowers are produced in greatest numbers in the spring; white to pink or purple flowers one or two inches in diameter are produced on new growth. The fruits of the genus *Citrus*, ranging from golfballs to footballs in size, are all edible, with or without the addition of sugar. Although the Chinese have long used both immature and fully ripened dried fruits and peels of the hardy orange medicinally, both peel and pulp contain an abundant bitter,

burning oil that gives juice and fruit a taste quite unlike that of the citrus fruits.

The hardy orange appears to have been introduced into the United States as an ornamental garden plant in 1869. It is widely planted throughout the South, and has proved hardy as far north as Philadelphia. As in China and Japan, its main use has been as either an ornamental or as a rootstock on which to bud citrus trees for cultivation. A row of hardy oranges makes an impenetrable

Author Photo

This hardy orange, also known as trifoliate orange, grows in the northeastern corner of the Linnaean Garden.

hedge, and there is a dwarf variety that is grown as an indoor pot plant. Budding consists of grafting a vegetative bud of the desired citrus variety to a rootstock of the disease-resistant hardy orange, yielding a tree with resistant roots and edible fruits; this is a common practice in the citrus industry.

As the common name implies, the plant can withstand freezing temperatures. Whereas citrus trees cannot abide temperatures much below 32°F, the hardy orange will survive those as low as −13°F. For this reason, the hardy orange has often been crossed with citrus species in an attempt to produce cold-hardy citrus fruits. Although hybrids are not easily produced because of the genetic differences between *Poncirus*, *Citrus*, and *Fortunella* (the kumquats), at one time or another the hardy orange has been successfully crossed with kumquats to produce citrumquats, with sweet oranges to produce citranges, with pummelos to produce citrumelos, with mandarins to produce citrandarins, with lemons to produce citremons, and with sour oranges to produce citradias. Some of these hybrids have in turn been crossed to one or the other parent or to other citrus species, producing such fanciful fruits as citrangequats, etc. The hybrids occasionally have proved valuable as vigorous, disease-resistant rootstocks for citrus trees, but even their best fruits still retain some of the characteristic bitter taste of the hardy orange.

Besides the tree in the Linnaean Garden, planted in the 1940's, other specimens have been grown at the Arboretum in Gray Summit. Two hardy oranges that were planted in the mid-1940's behind the sinuous brick wall in the area of what at one time was to be the new Rose Garden are still growing. However, they have been killed back periodically by the coldest winter temperatures, as were three other trees that were planted next to one of the greenhouses around 1926. According to Frank Steinberg, Superintendent Emeritus of the Arboretum, the last of these finally succumbed about eight years ago, but those in the Arboretum's Rose Garden and three of indeterminate age in the old Nursery at the Arboretum still survive. So, although the hardy orange will survive temperatures of −13°F, in the St. Louis area it still must be planted in sheltered locations in order to survive our coldest winter winds. □

Spring Flowers at the Arboretum

May & June

Duncan M. Porter

THIS ARTICLE is a continuation of one in the last *Bulletin,* which listed and discussed the wildflowers of the Garden's Arboretum in Gray Summit for March and April. The reader should refer to the map in that issue (p. 27), which was kindly and expertly drawn by Marjorie Richardson, for the localities mentioned herein.

As spring progresses, and the trees and shrubs begin to expand their leaves, the flowers of the forest floor become fewer and less showy. However, at the same time those in the glades, grasslands, and forest paths come into their own. While the forest flowers have had their day, the spring rains and balmy days now provide the impetus for wildflowers of other habitats to step into the spotlight.

Although this article treats the wildflowers of May and June, and the last of those of March and April, obviously a certain amount of overlap in flowering times can be expected of the plants from each list. This is especially true for plants which flower during the latter half of April or the first half of May. The reader is cautioned to check a flowering plant collected at this time against both keys—especially if it doesn't seem to fit in one key or the other! Eventually, we plan to produce a single key to all the wildflowers at the Arboretum, thus eliminating the need to hop from key to key.

An excellent book on our wildflower flora was inadvertantly not mentioned in the preceding article, Theresa C. Rickett's *Wild Flowers of Missouri* (1954). Plants in this handy paperback guide (available at the Garden Gate Shop for $1.25) are listed by flowering times, and many are illustrated. This book includes common wild-

flowers from the entire state, and a single key to them all is provided. Unfortunately this key is confusing and difficult for use by the inexperienced amateur. However, the detailed descriptions, illustrations, and discussions of the plants make it an indespensible addition to the library of any wildflower lover.

KEY TO FLOWERING SHRUBS, SMALL TREES, AND VINES

1. Vines or sprawling shrubs, the leaves of three shining leaflets . . . . . .Poison Ivy
1. Upright shrubs or small trees, the leaves not of three shining leaflets.
   2. Flowers purple, clustered in long spikes at the tops of the stems . . . . . .Lead Plant
   2. Flowers white, in rounded clusters at the ends of the branches.
      3. Leaves unlobed, the stalks densely covered with red hairs . . . . . .Black Haw
      3. Leaves shallowly three-lobed, the stalks not covered with red hairs . . . . . .Ninebark

LOCALITIES/USES OF FLOWERING SHRUBS, SMALL TREES, AND VINES

BLACK HAW *(Viburnum rufidulum*—Honeysuckle Family*)* occurs in rocky open woods, such as those along the top of the bluff at Cliff Overlook. The edible fruits are eaten by birds and mammals, including man.

LEAD PLANT *(Amorpha canescens*—Pea Family*)* also occurs in rocky open woods. This legume is an important forage plant for stock; it sometimes is grown as a garden ornamental as well.

NINEBARK *(Physocarpus opulifolius*—Rose Family*)* is a plant of glade edges to be sought in the woods surrounding Long Glade. This Missouri native is often cultivated for its clusters of white flowers and stringy, peeling bark.

POISON IVY *(Toxicodendron radicans*—Cashew Family*)* is a plant to avoid. If you have handled it while trying to identify it, wash thoroughly with a strong soap as soon as possible. Even though deer browse the foliage and birds eat the fruits, most people get a nasty dermatitis from all its parts. Poison Ivy may be found practically anywhere in the Arboretum, except perhaps for the glades, but the most spectacular specimens are those climbing up the trees in the flood plain forest along the River Trail.

KEY TO WILDFLOWERS

1. Flowers yellow (rarely yellow and red), orange, white, or green.
   2. Flowers yellow or orange.
      3. Leaves simple and unlobed.
         4. Flowers bunched together at the tops of the stalks to form a flower-like inflorescence.
            5. Flower-like inflorescences with the outer flowers orange and petal-like, the inner smaller and dark brown-purple . . . . . Black-eyed Susan
            5. Flower-like inflorescences with both the outer petal-like flowers and the smaller inner flowers yellow . . . . . Wild Coreopsis
         4. Flowers occurring singly, not bunched together into a flower-like inflorescence . . . . . Missouri Primrose
      3. Leaves three to five or more lobed or parted.
         6. Leaves of three leaflets.
            7. Flowers yellow and red, the petals spurred . . . . . Columbine
            7. Flowers yellow, the petals not spurred.
               8. Leaflets bilobed.
                  9. Stems creeping on the ground and rooting . . . . . Creeping Sorrel
                  9. Stems upright, rooting only at their bases . . . . . Yellow Wood Sorrel
               8. Leaflets not bilobed . . . . . Yellow Sweet Clover
         6. Leaves of five or more leaflets.
            10. Petals four . . . . . Yellow Rocket
            10. Petals five . . . . . Cinquefoil
   2. Flowers white or green.
      11. Flowers green . . . . . Green Dragon
      11. Flowers white.
         12. Flowers pansy-like, the leaves heart-shaped . . . . . White Violet
         12. Flowers not pansy-like, the leaves not heart-shaped.
            13. Leaves lobed or divided.
               14. Flowers one per plant, the leaves umbrella-like . . . . . May Apple
               14. Flowers many per plant, the leaves not umbrella-like . . . . . Yarrow
            13. Leaves simple and unlobed.
               15. Leaves opposite in pairs on the stems.
                  16. Flowers of five separate petals that are notched at the tips . . . . . Sandwort
                  16. Flowers not of five separate petals notched at the tips.
                     17. Flowers one per plant . . . . . Leather Flower
                     17. Flowers many per plant.
                        18. Stems and leaves hairy, the inflorescence branches not sticky . . . . . Beard-tongue
                        18. Stems and leaves not hairy, the inflorescence branches sticky . . . . . Foxglove Penstemon
               15. Leaves not opposite in pairs on the stems.
                  19. Leaves mainly in circles of eight on the stems . . . . . Bedstraw
                  19. Leaves not in circles of eight on the stems.
                     20. Leaves alternating on the stems . . . . . Bastard Toadflax
                     20. Leaves in a circle at the base of the stem . . . . . Pussy Toes
1. Flowers pink, red, blue, or purple.
   21. Leaves narrow and grass-like.
      22. Flowers pink, sometimes replaced by bulblets . . . . . Wild Garlic

22. Flowers lilac or blue, never replaced by bulblets.
23. Petal-like parts 3 . . . . . Spiderwort
23. Petal-like parts 6 . . . . . Wild Hyacinth
21. Leaves not narrow and grass-like.
24. The plant with white sap.
25. Leaves alternating on the stems . . . . . Blue Star
25. Leaves opposite in pairs or in whorls of four on the stems.
26. Leaves opposite in pairs . . . . . Purple Milkweed
26. Leaves in whorls of four . . . . . Milkweed
24. The plant with clear sap.
27. Leaves all at the base of the flowering stem . . . . . Shooting Star
27. Leaves present on the flowering stem.
28. Leaves simple and undivided.
29. Leaves alternating on the stems . . . . . Pale-purple Coneflower
29. Leaves opposite in pairs on the stems.
30. Flowers many, clustered together at the tops of the stems . . . . . Horsemint
30. Flowers few, found singly in the angles of the uppermost leaves on the stems . . . . . Creeping Skullcap
28. Leaves deeply divided or lobed.
31. Flowers deep blue or violet, spurred . . . . . Prairie Larkspur
31. Flowers pale blue or pink, not spurred.
32. Leaves opposite in pairs on the stems . . . . . Wild Geranium
32. Leaves alternating on the stems.
33. Petals fringed on the edges . . . . . Miami Mist
33. Petals smooth on the edges . . . . . Woollen Breeches

LOCALITIES/USES OF WILDFLOWERS

BASTARD TOADFLAX (*Comandra richardsiana*—Sandlewood Family) has roots that are attached to those of other plants, making it a root parasite. Many plants will be found along the top of the bluff at Cliff Overlook.

BEARD-TONGUE (*Penstemon pallidus*—Figwort Family) occurs in open rocky woods like those along Cliff Ridge Trail. They are good forage plants for stock.

BEDSTRAW (*Galium aparine*—Coffee Family) is to be found throughout the woods at the Arboretum. The hiker will be attracted not by the plant's small white flowers, but by the rough hairs on the scrambling stems that cause them to stick to his clothing. The dried fruits make a passable substitute for coffee beans.

BLACK-EYED SUSAN (*Rudbeckia hirta*—Sunflower Family), a plant of open areas, occurs in the grasslands near the Trail House. The basal leaves provide an important winter food for deer.

BLUE STAR (*Amsonia illustris*—Dogbane Family) grows in rocky areas along streams, such as the gravel bars along the Meramec

River. The attractive pale blue flowers make it a good ornamental plant for the garden.

CINQUEFOIL (*Potentilla recta*—Rose Family) is an introduced and thoroughly naturalized European weed of grasslands and roadsides. Look for it near the Trail House. This species provides winter forage for deer.

COLUMBINE (*Aquilegia canadensis*—Buttercup Family) usually grows on limestone bluffs and ledges. A number of plants, probably planted, will be found on the tops of boulders along the Boulder Trail below Long Glade. This is another good species for the wildflower garden.

CREEPING SKULLCAP (*Scutellaria parvula*—Mint Family) is a glade and prairie plant occurring along the periphery of Long Glade. The name skullcap comes from the shape of the flower, not from any poisonous property.

CREEPING SORREL (*Oxalis corniculata*—Wood Sorrel Family) is another introduced and thoroughly naturalized weed. It will be found in grassy areas or along the trails in sunny spots. The stems and leaves have a refreshing acid taste.

FOXGLOVE PENSTEMON (*Penstemon digitalis*—Figwort Family) grows in rich alluvial woods. Large colonies occur in the low woods along the River Trail. Like the closely-related Beardtongue, the plants are good stock forage.

GREEN DRAGON (*Arisaema dracontium*—Arum Family) occurs in rich woods. Look for it along Ledge Ridge Trail near its junction with Cliff Ridge Trail. The roots were used by the Indians as a starch source in the same way as those of the Jack-in-the-pulpit (see last month's article).

HORSEMINT (*Monarda russeliana*—Mint Family) grows in the rocky woods along Cliff Ridge Trail. A tea may be made from the leaves.

LEATHER FLOWER (*Clematis fremontii* var. *riehlii*—Buttercup Family) is a glade plant that has been planted on Long Glade near where it is crossed by Boulder Trail. Leather Flower is reputed to be poisonous to livestock.

MAY APPLE (*Podophyllum peltatum*—Barberry Family) forms large colonies in the open woods and surrounding grasslands. One colony may be found near the road next to Wood Duck Pond. The ripe fruits are edible, although they may prove cathartic, but the rest of the plant is poisonous.

MIAMI MIST *(Phacelia purshii*—Waterleaf Family*)* occurs on moist slopes in the woods. It is common along the Wildflower Trail near the large sandstone outcrop.

MILKWEED *(Asclepias quadrifolia*—Milkweed Family*)* is scattered in the rich open woods along the Ledge Ridge Trail. Like most milkweeds, it is probably poisonous.

MISSOURI PRIMROSE *(Oenothera missouriensis*—Evening Primrose*)* is a glade plant to be sought on Long Glade. Its large attractive yellow flowers have served to make it a showy garden plant.

PALE-PURPLE CONEFLOWER *(Echinacea pallida*—Sunflower Family*)* is another attractive plant on Long Glade. It is eagerly sought after by stock, soon disappearing in grazed areas.

PRAIRIE LARKSPUR *(Delphinium carolinianum*—Buttercup Family*)* also occurs on Long Glade. The deep blue or purple flowers are pretty, but the plant is poisonous to stock.

PURPLE MILKWEED *(Asclepias purpurascens*—Milkweed Family*)* is found in rocky open woods like those along Ledge Ridge Trail. Although the leaves, stems, and roots are probably poisonous, the unopened or opened flower clusters are reputedly boiled and eaten like broccoli.

PUSSY TOES *(Antennaria plantaginifolia*—Sunflower Family*)* occurs in colonies in sunny places along the trails. Several colonies will be found along Cliff Ridge Trail near its junction with Labbadie Trace. The overwintering leaves form an important wildlife food for both birds and mammals.

SANDWORT *(Arenaria patula*—Pink Family*)* is a glade plant that occurs in large numbers on Long Glade, but being built close to the ground you may have to stoop to find it.

SHOOTING STAR *(Dodecatheon meadia*—Primrose Family*)* will be found on glades and sunny rocky areas in the woods. Look for it along Boulder Trail near its intersection with the Wildflower Trail. The flowers are reported to smell like grape juice, and the roots like canned corn beef.

SPIDERWORT *(Tradescantia ohiensis*—Spiderwort Family*)* grows in wet sunny areas, and is to be seen along Ledge Ridge Trail below the Trailhouse. Spiderworts are easily grown ground covers for the garden.

WHITE VIOLET *(Viola striata*—Violet Family*)* occurs in low rich woods. It is common in the mowed areas under the trees where the road crosses Brush Creek near Wood Duck Pond. This is an-

other good species for the wildflower garden.

WILD COREOPSIS *(Coreopsis lanceolata*—Sunflower Family*)* is a plant of glades and sunny rocky areas. It is common on Long Glade. The seeds are eaten by wild turkeys and prairie chickens.

WILD GARLIC *(Allium canadense*--Lily Family*)* occurs in flat sunny places. Look for it along Ledge Ridge Trail below the Trail House. This is a good substitute for onions or chives, but if cows eat it the milk comes out smelling of onions.

WILD GERANIUM *(Geranium maculatum*—Geranium Family*)* grows in rocky woods. It is common in the woods along Boulder Trail below Long Glade. It is occasionally cultivated, less so than it should be.

WILD HYACINTH *(Camassia scilloides*—Lily Family*)* is found in rocky soils, both sunny and shady. It is scattered along the road above the Barn. The bulb at the base of the stem was eaten by the Indians.

WOOLLEN BREECHES *(Hydrophyllum appendiculatum*—Waterleaf Family*)* will be encountered in wet shady areas. Seek it along the edges of Ledge Ridge Trail where it meets the Wildflower Trail.

YARROW *(Achillea millefolium*—Sunflower Family*)* occurs in open grasslands, and is common near the Trail House. The leaves sometimes are used for seasoning, and when boiled make a tea used to treat colds and as a blood tonic. Occasionally a form with pink flowers is seen.

YELLOW ROCKET *(Barbarea vulgaris*—Mustard Family*)* is a European weed that grows in grassy areas along the roads. It will be encountered about the Trail House.

YELLOW SWEET CLOVER *(Melilotus officinalis*—Pea Family*)* also occurs along roadsides near the Trail House. It is a good pasture plant for stock, and honey produced from it is highly regarded. Apparently originally native to Asia, it now is found throughout the United States.

YELLOW WOOD SORREL *(Oxalis stricta*—Wood Sorrel Family*)* is a species of open woods, spreading into sunny spots along the trails. Look for it along Ledge Ridge Trail. Stems, leaves, and flowers may be added to salads to impart a sharp acid taste. □

What's Going on at the Garden?

The Augusta Freund Littmann Memorial Orchid Fund

Claude Johnston

The Augusta Freund Littmann orchid is a living memorial to the memory of one of St. Louis' well-known citizens and gardeners.

The Flower Arrangers Circle of Greater St. Louis has very generously donated $500.00 to the Garden to set up a living memorial to the late Mrs. Augusta Freund Littmann. Mrs. Littmann was the Circle's founder and director and remained active in the Club up to her death in December, 1970, at the age of 89. Well known for her humanitarian and cultural involvements in the St. Louis community, she also received recognition nationally and internationally as an arranger of flowers, both as a judge and teacher of traditional

and modern types of floral arrangements and as a skilled teacher in Ikebana in which she held a Masters certificate from Japan. She was one of the founders of the headquarters of National Council of State Garden Clubs, Inc., 4441 Magnolia Avenue, St. Louis.

As a living memorial the Missouri Botanical Garden selected a seedling orchid of LC White Queen crossed with LC Easter Belle, bearing the number 1-49-12, and has named it Augusta Freund Littmann. This is a beautiful scented light mauve orchid that flowers in the spring of the year. The funds of this memorial are being used to add a collection of miniature Cymbidiums to the collection. The Cymbidium collection has had no major additions since the early 1950's, so this is a valuable addition and one that will increase in value.

The Garden deeply appreciates the trust placed with them in this living memorial and many people will see and enjoy the results of such a generous gesture on behalf of a well known citizen who added much to the lives of her friends.

A Stroll through the Garden

Claude Johnston

Any one of thirty-eight Garden Guides is ready, willing and trained to stroll with you or a group of your friends down the paths of the Missouri Botanical Garden, explaining as she goes the various horticultural and botanical displays you will see on the way.

"We always try to make our volunteer guides feel they are the contact between the public and the Garden," said Mrs. Shade Morris, Chairman of the Guides. Appearance, a pleasant attitude, and knowledge of the Garden are very important. Therefore, each volun-

Joel Gold

teer is required to attend classes one day a week for eight weeks ending with a final examination. The classes and lectures are given by the staff and cover the eight tours offered to the public. These include: the Desert Ecology Tour; Historical Tour, which notes the original buildings on the grounds, Tower Grove House and the history of St. Louis in the 1800's; Henry Shaw's Garden Tour, a general tour; the Blooming Tour; Tropical Rain Forest Tour; Herbarium Tour; the Economic Plants of South America Tour; and the Tree Trail Tour, usually given in the spring and fall of the year. "The two main requirements of a Guide," says Mrs. Morris, "are willingness to learn the material and dependability. We have one hour tours scheduled throughout the year for school children (third grade up), garden clubs, conventions, etc. These tours are made by reservation, and we have to be able to depend upon our Guide being there." In the four years tours have been offered (the first Training Program began in 1968), approximately 40,000 people have been guided

Joel Gold

through the Garden. The largest group at one time was 500—the Garden Club of America, whose members were here from all the fifty states.

Volunteer Guides come from the entire St. Louis area as far as Belleville, Illinois. About 90% come from membership of the Garden; the rest are made up of newcomers to St. Louis or friends of a member.

After graduation, the new Guides are given green tunics with red flower pot pockets and a name tag to wear to distinguish them from the tour group. Should the Guide, after serving as a Tour Guide, wish to volunteer in the Growing Center, she is given the option to do so. Here she can use her training in meeting the public, giving information, selling plants, soil mixtures, booklets, and demonstrate growing and planting skills such as potting, transplanting, watering, and sowing seeds. There is a Guide on duty in the Growing Center each week day from 10:00 a.m. until 2:00 p.m.

The Tour Guides and the Growing Center Guides Program is co-ordinated through the Community Services office. Ruth (Mrs. Philip) Parker schedules all tours and dispenses information about the program. □

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